MODERN MECHANICS AND INVENTIONS

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SEE PAGE 38

we have placed machinists, carpenters, masons, plumbers, railroad men, office clerks, farmers and even laborers in fine Drafting Jobs under this plan. Mail coupon for details of our remarkable offer.

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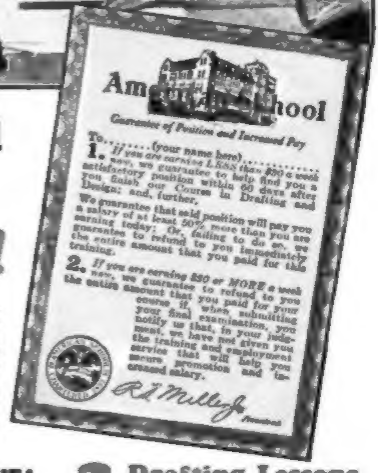

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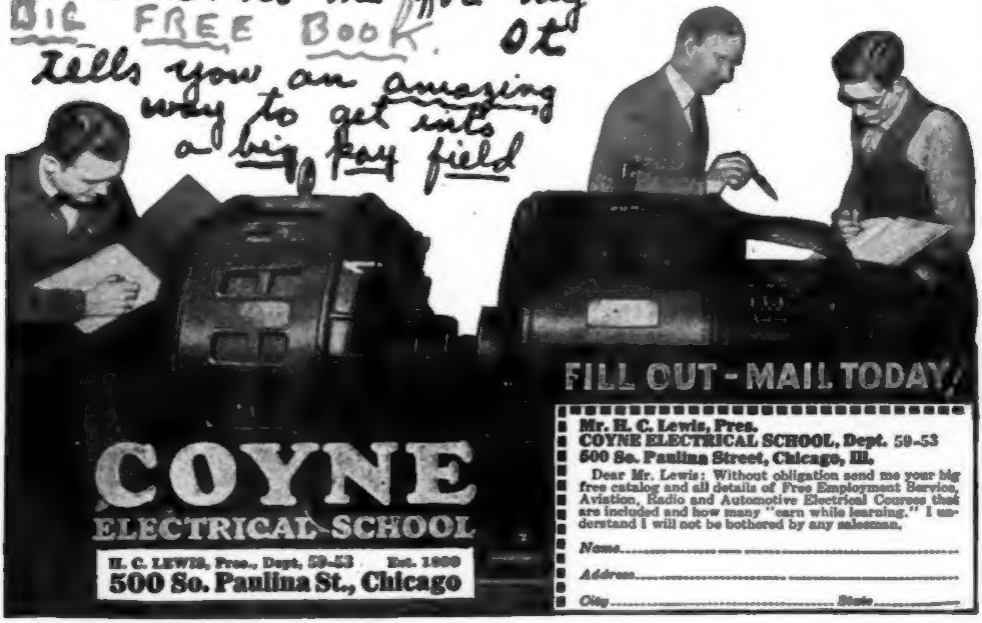

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MODERN MECHANICS AND INVENTIONS

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Edited by Experts

Listed below are the members of the Modern Mechanics Board of Editors, all qualified by national repute to serve as authorities. They will gladly answer questions from readers concerning their departments. Address them in care of this magazine, Robbinsdale, Minn.

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What's to Come NEXT MONTH

¶Plans for the Gotha Glider, famous soaring glider designed by German experts, will be published for the first time ¶Announcement of Modern Mechanics' great "Win Your Wings!" Contest, in which a flying course and scores of other prizes will go to the lucky contestants ¶Startling Expose of swindlers' tricks . . . How to Test Yourself for Your Job . . . High Dives From Cloudland—all about the thrills of parachuting ¶Concluding installment of plans for the Alco Sportplane, completing details for construction of this fine little airplane ¶Regular departments on Aviation, Boy's Workbench, Motor Mechanics, Radio, and Amateur Movies . . . continuation of "Carter of the Red Planet" . . . and other great features.

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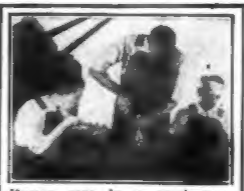
LOW PAY.. LONG HOURS.. ROUTINE.. NO FUTURE

Always worrying over money. Always skimping and economizing—going without the comforts and luxuries that every man DESERVES for his family and himself.

The Time Clock—a badge of hawk-like supervision and The Rut. A constant reminder that one is "just another name on the pay-roll."



Human cogs in a great machine. No chance to meet people, travel, or have interesting experiences. A long, slow, tiresome road that leads nowhere.

Always wondering what would happen in case of a "lay-off" or loss of job. No chance to express ability—no chance to get ahead. COULD there be a way out?

I Said "Good-bye" to It All After Reading This Amazing Book— Raised My Pay 700%!

Where Shall We Send Your Copy—Free?

WHEN a man who has been struggling along at a low-pay job suddenly steps out and commences to earn real money—$5000, $7500, or $10,000 a year—he usually gives his friends quite a shock. It's hard for them to believe he is the same man they used to know . . . but such things happen much more frequently than most people realize. Not only one, but HUNDREDS have altered the whole course of their lives after reading the amazing book illustrated at the right.

True, it is only a **book**—just seven ounces of paper and printer's ink—but it contains the most vivid and inspiring message that any ambitious man can read! It reveals facts and secrets that will open almost any man's eyes to things he has never **even dreamed of!**

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For example, R. B. Hansen, of Akron, Ohio, is just one case. Not long ago he was a foreman in the rubber-curing room of a big factory at a salary of $160 a month. One day this remarkable volume, "The Secrets of Modern Dynamic Salesmanship," fell into his hands. And from that day on, Mr. Hansen clearly saw the way to say, "Good-bye" forever to low pay, long hours, and tiresome routine! Today he has reaped the rewards that this little volume placed within his reach. His salary runs well into the 5-figure class—actually exceeding $10,000 a year!

Another man, Wm. Shore of Neenach, California, was a cowboy when he sent for "The Secrets of Modern Dynamic Salesmanship." Now he is a star salesman making as high as $525 in a single week. O. D. Oliver of Norman, Oklahoma, read it and jumped from $200 a month to over $10,000 a year! C. V. Champion of Danville, Illinois, raised his salary to over $10,000 a year and became President of his company in the bargain!

A Few Weeks—Then Bigger Pay

There was nothing "different" about any of these men when they started. None of them had any special advantages—although all of them realized that SALESMANSHIP offers bigger rewards than any other profession under the sun. But, like many other men, they subscribed to the foolish belief that successful salesmen are born with some sort of "magic gift." "The Secrets of Modern Dynamic Salesmanship" showed them that nothing could be farther from the truth! Salesmanship is just like any other profession. It has certain fundamental rules and laws—laws that you can master as easily as you learned the alphabet.

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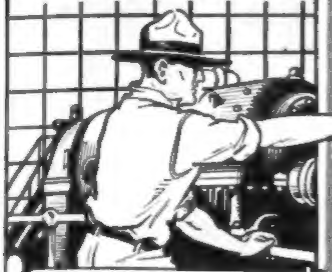

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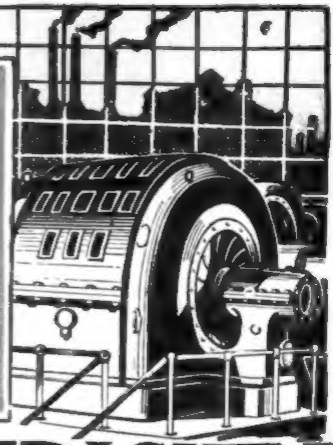

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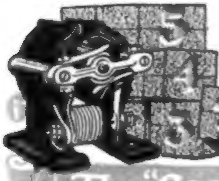

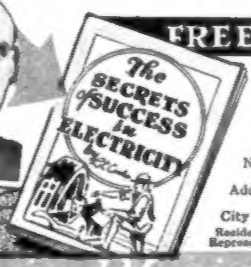

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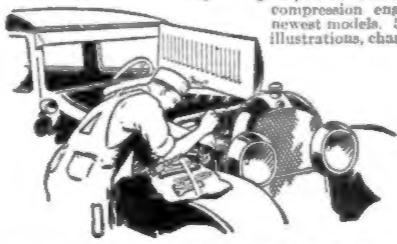

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Can you take the "play" out of differentials? Can you kill the SHIMMY in steering? Can you reset TIMING? Can you put your finger on ENGINE TROUBLE instantly without guessing or tinkering? Can you pull the STARTER off and fix it? Can you adjust and repair transmissions, rear-axles, engines and electrical systems? Can you make emergency repairs on the road or are you helpless when some little thing goes wrong? Is your hand always in your pocket, **paying, paying, paying?**

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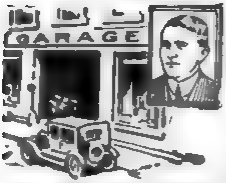

George Smith owns an agency and repair shop in West Alexandria, Ohio. He makes $200 a week.

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Learn the auto and tractor business by the McSweeny method, then step out and get a good job at $75 to $125 a week or open your own repair shop and make up to $10,000 a year. Trained men are needed everywhere. Opportunities galore! Eight weeks training fits you to open repair shop or to go on with one of the big firms waiting for trained men. Read what George Smith and C. E. Gillespie have done. Hundreds of other McSweeny trained men can tell as interesting facts. Every month McSweeny men who complete their training are taking the place of half-trained and incompletely self-trained men.

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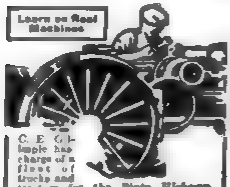

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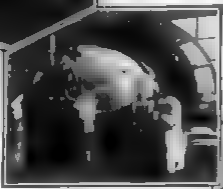
IT'S EASY THIS WAY

Fascinating practical shop work in my big school fits you. Not a correspondence course.



No Education or Experience Needed

No books to read. No dry lectures to listen to. You learn by doing. I don't care if you can't tell a motor from a horse and buggy now. When you graduate I guarantee that you'll know electricity from "A" to "Z." If you're not fitted to fill a big-pay job I'll refund every penny of your tuition.

Satisfaction Guaranteed!

You are the sole judge of McSweeny training.

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The Shop Mail Box

WHEN a marksman scores a bull's-eye he has a right to be proud of his skill. Some will say he has made a chance shot, but if he keeps his gun well oiled and his aim steady, scoring consistently, he is deserving of his title of sharpshooter. His pride is justified.

Hitting the Mark

It is with some of the pride of a marksman that MODERN MECHANICS has found its aim good. In the first volume, closed with last issue, the "how-to-build" articles, the features, and the short, pithy news photos have struck home to the hearts of the thousands of readers who have been looking for a magazine loaded with just such a cargo as MODERN MECHANICS has carried. Letters by the thousand attest to the fact; further, the growth of the magazine has been phenomenal—support and applause have come from those who have discovered MODERN MECHANICS and are eager for more. Our aim is to gather the really interesting, "do-able" things, the educative and informative things, and present them in magazine form. We have scored a bull's-eye. Our aim has been good. The editors take no small measure of pride in learning that the magazine meets with the enthusiastic approval of more than half a million readers every month.

Reader Suggestions

In hewing to a line which satisfies every reader, suggestions are always in order, and if you have a criticism or a suggestion, fer the love of Mike, let's hear it! This is your magazine, friend, and your name ought to be added to the list of those who have contributed to make it what it is.

We wish you could sit across the correspondence table and see the letters which come in concerning some feature the magazine has carried. Letters from every corner of the world show, for instance, that this month a great many readers will have completed a model of the wirelessly controlled battleship and will be testing it out in the balmy June breezes.

Radio Battleship Popular

Concerning this very popular how-to-build, which ran in February, several have asked for an explanation on the wiring of the relay. Our Radio Editor, Chas. Magee Adams, has given us a diagram which many have asked for, and we trust this will clear up the manner in which the decoherer and the aerial are hooked up. See second page of the Mail Box.

One of the letters, picked at random, since it is typical of the many we receive, comes from Port Arthur, Ontario. It says:

> **Received the first issue after subscribing. Thanks for taking care of the matter. I have read Carl Duede's story of his glider and wish he'd given more details, like Rouse when he wrote up the Heath story.**
>
> **And you know, I rather enjoyed that cover. Stick to pictures, not posters! Col. Hartney, too, looks like he must have been very young to have had the responsibilities of a command "over there." His story was a real adventure!**
>
> **Some day I am going to send you a picture of my basement shop. Some of the machines I have made really run and are wonderful to behold. Modern Mechanics is fine, and ought to stay out of the old rut.**
>
> **Sincerely yours,**
>
> **Burton Adams.**

YOU 'GO-AHEAD' FELLOWS

HERE'S *the* PAY-RAISING HELP YOU NEED

TO GET ahead in your present job—or to make good in another line—make use of good practical books by recognized expert authorities. Here is a list of the famous "Willcox" Books—the livest books on the livest subjects today—Airplanes—Autos—Electricity—Radio—etc. Every book written by a world-recognized authority and O. K.'d and recommended by engineers and other leading authorities. You are bound to succeed with "Willcox" Books to help you—the best book on the subject. They are practical, up-to-date, well illustrated, and written so you can understand them.

Dyke's Automobile and Gasoline Engine Encyclopedia, by A. L. Dyke. For 18 years the biggest selling and most popular of all Auto Books. Thousands of auto mechanics swear by Dyke's. Our Government used entire editions of it during the War. New fifteenth edition tells you everything you need to know about every auto. New Ford supplement free. 7x9¼ inches, 1271 pages, 1300 illustrations and folding charts. Postpaid, Cloth Binding $6.00, Flexible $7.50.

The Aircraft Engine Instructor, by A. L. Dyke. Positively the last word on Airplane Engines and Accessories. It covers every type of Aircraft Engine, starters, magnetos, carburetors, controls, etc. Engineers, Airplane Manufacturers, Government Departments and others assisted the author in its preparation. Flexible binding. 420 pages, 400 illustrations. Large folding charts in colors. Postpaid $5.00.

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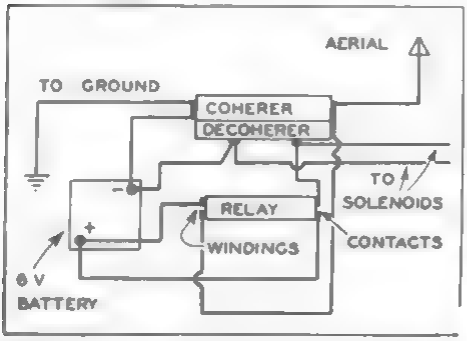
Chicago Letter Discloses Photo of Parasol in Flight at 2500 Feet

The Parasol in Flight

What do you think of the shot of the Heath Parasol in flight over Chicago, shown above? This is the picture spoken of last month, and now here it is! It was built from the same plans published in MODERN MECHANICS, and was built by James Church, of Chicago. Ed. Heath, the designer, is at the stick. The plane has evidently about 2,500 feet of altitude. The shot was cleared up a bit—as the photo was misty. Will the Parasol fly? Hola!

Plans Still Available

Although the plans for this ship were run in MODERN MECHANICS during the months of January, February and March, they are still available in the FLYING MANUAL. The FLYING MANUAL is on sale at the newsstand where you bought this copy of MODERN MECHANICS. If your newsdealer is out of copies of the MANUAL, send a dollar bill to the Circulation Department of MODERN MECHANICS, Robbinsdale, Minn., and the book will be forwarded to your address. It contains the complete set of plans and prints for building the Heath Parasol, as well as the Russel sportplane.



This shows how the relay for the Radio Controlled Battleship is hooked up. Readers have asked to have this point clarified, so our radio editor here gives the proper hookup. See the February issue of Modern Mechanics.

Biggest Contest Yet

Next month MODERN MECHANICS will announce a prize contest which will prove the most popular we have had to date. The winner will be given transportation to a flying school and his tuition paid for 10 hours of flying instruction!

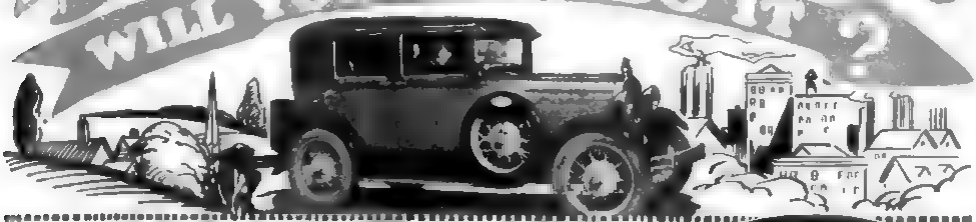
There will be forty other prizes offered, among them, a complete flying outfit, numerous helmets and goggles, as well as certificates entitling you to a ride with any commercial pilot you choose should you win a prize.

Everyone in on this contest! It offers a chance for all to win a worthwhile prize. Details will be published next month, along with the other usual splendid features such as an article on the building of a German type glider, a big expose on the crazy inventions which swindlers use to bilk the unwary investor, and so on.

Of course, there will be the continuation of Carter of the Red Planet, the fascinating serial by Edgar Rice Burroughs who wrote Tarzan of the Apes. The adventures of John Carter among the Green Martians with their four-armed bodies is as fascinating a piece of fantastic fiction as has ever been published if we are to believe the letters from readers who like the story.

42 Miles on 1 Gallon of GAS

WILL YOUR CAR DO IT?



New Moisture Humidifier & Carbon Eliminator

An amazing Scientific Humidifier has been patented throughout the World that beats any ever got out. It makes engines run ALL THE TIME with the same wonderful efficiency they do on a cool moist night. It gives MORE pep and power, HIGHER top speed, eliminates hard carbon, and gives AMAZING mileage. Fords report 28 to 42 miles per gallon. Other makes (both American and Foreign) report marvelous increases of ¼ to double mileage. Some of the best records are:

	Miles		Miles		Miles		Miles
Buick	28¼	Ford (Model T)	42	Oakland	31	Pierce Arrow	22
Cadillac	21½	Ford (Model A)	40	Oldsmobile	34½	Pontiac	31
Chevrolet	41	Hudson	23½	Overland	41	Reo	26½
Chrysler	30¾	Hupmobile	24½	Packard	21½	Star	41¾
Dodge	31½	Marmon	21½	Plymouth	29	Studebaker	29
Essex	32	Nash	30	Graham-Paige	23½	Willys-Knight	29

And Hundreds of Other Wonderful Records on ALL American and Foreign Makes

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Man with Car

VIX sells itself by 8 STARTLING demonstrations—BIG, STUNNING, ASTOUNDING DEMONSTRATIONS. Successful VIX men make MORE MONEY than they ever made before

Free Trial TRY This New Principle Gas Saving AT MY RISK

Try this wonderful VIX Moisture Humidifier and Carbon Eliminator AT MY RISK on YOUR OWN CAR to prove that VAPOR MOISTURE (drawn from Radiator to Engine) gives you that wonderful night driving effect ALL THE TIME with MORE mileage from gas and oil—eliminates hard carbon accumulation—gives MORE power, a SNAPPIER, PEPPIER motor, FASTER acceleration, a SMOOTHER, QUIETER running engine and HIGHER top speed.

VIX will PROVE ITS MONEY SAVING MERIT on your own car by 8 DEMONSTRATIONS—conducted by yourself AT MY RISK—the most SENSATIONAL, most ASTOUNDING, most CONVINCING DEMONSTRATIONS you ever saw. If you don't find from your tests that it does MORE than I claim, return it and it COSTS YOU NOTHING. **I want wide-awake hustling, County, State, Province and National Agencies everywhere, part or full time, to make $350 to $1500 per month filling the great DEMAND for this wonderful invention wherever introduced. Write for my FREE TRIAL and MONEY MAKING OFFER. Use coupon below.**

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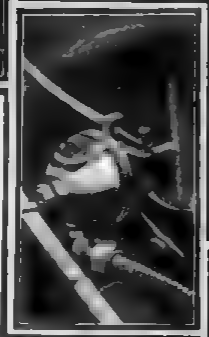

Pictures here and at top show Model "B" VIX attached to my own New Model A Ford. This car is wonderfully improved in performance with the VIX Moisture Humidifier. So is every Auto, Truck, Tractor, Taxi, Bus, Marine, Stationary and Aircraft Engine, both American and all Foreign makes.

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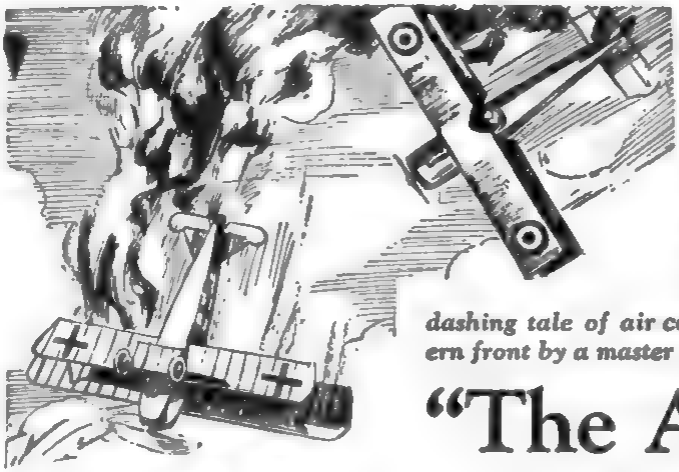
Valor in the Skies



Windy's crashes were so numerous that some of the boys pegged him as a "prop-winder." Then when his C. O. threatened to take away his wings he proved his mettle. A dashing tale of air combat on the western front by a master . . . .

"The Ace of Alibis"

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As my partner I furnish your groceries at wholesale — I do everything to see that my partners get all the advantages of Big Business. Big FREE supply contains over 32 full size packages of highest quality products. Choose all your groceries, at wholesale, from my big list of over 300 home necessities. Quality backed by $25,000.00 Bond.

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LOOK!

$117.50 First 5 Days

Made $117.50 first 5 days. Your products are marvelous. Anyone can easily make money with Health-O." — A. Pelletier, Mass.

Always Sure of $10 a Day

Mrs. Bower, a W. Va., housewife writes: "I am always sure of $10 a day profit with Health-O Products."

$31.65 First Day

"Just received sample case. Started among acquaintances and first day made $31.65."—B. L. Simmons, So. Car.

$101.25 First Week

Ruth Hoffman never sold a thing before in her life. She proved that experience was not necessary—she writes: "Made $101.25 first week."

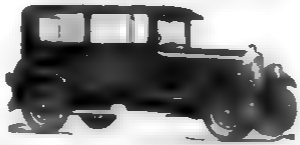
$24.85 in Two Evenings

T. J. Osborne two days after receiving sample case enthusiastically writes: "I have been out only two evenings and have taken orders for $24.85."

Easy for you to make big money. I look out for welfare of my partners.

I don't want you to take any chances. I GUARANTEE your income. This is the most amazing guarantee ever made for a steady, year 'round income. I can make this guarantee because I know you can do as well as my other partners whose letters are shown on this page.

I Furnish You Chrysler Coach



This is part of my FREE outfit to you. I want my partners to be prosperous and look prosperous to gain respect from everyone in your locality. That's why I will give you ABSOLUTELY FREE this brand new Chrysler Coach to use in your business. This is no contest! It is yours to keep just as soon as you show me you are in earnest. Send coupon today.

Besides going 50-50 with my partners on profits, I WILL FURNISH YOUR HOME with hundreds of wonderful premiums, including pianos, living room sets, etc., that I give as premiums. Send coupon at once for my signed guarantee of $100.00 a week for full time or $3.00 per hour for spare time work.

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Without obligation on my part send at once application for territory and details of partnership offer, free food products.

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He Mailed a Coupon Like This

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1418 Pendleton Ave., St. Louis, Mo.
Without obligating me, please send me illustrated description of KRISS-KROSS Stropper and your offer of a 3-Way Razor FREE.

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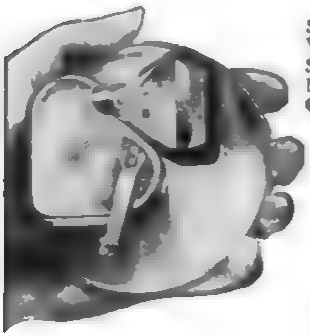
Address _____

City _____ State _____

☐ Check here if interested in becoming representative.

—and it Brought Him 1129 Cool Shaves from One Single Blade!



Another Triumph for KRISS-KROSS, The Most Amazing Shaving Invention Ever Patented! Mr. T. Liddle, of Illinois, Wrote Recently: "I Have Been Using One of Your Stroppers Since May, 1924. I Shave Every Morning and I Am STILL ON MY FIRST BLADE!" Read Astonishing Details. Then Act At Once For Real Shaving Joy.

NO wonder KRISS-KROSS marks such a radical advance in shaving comfort and economy! For now at last it has captured a secret that has baffled scientists for years! It actually reproduces mechanically the diagonal flip-flop master-barber's stroke that gives razor blades the keenest cutting edge that steel can take! Pressure decreases automatically. And in just 11 seconds you are ready for the coolest, slickest shave you ever had!

AN ECONOMY—AND A LUXURY, TOO

KRISS-KROSS not only introduces you to undreamed-of shaving luxury—but cuts shaving costs 83%. It makes your blades last almost indefinitely. Any number of cases are on record where a KRISS-KROSS user reports over 365 keen shaves a year from the same blade! For example, C. S. Stephenson, (Oklahoma) writes: "I have been using one blade continuously for 1 year and 9 months and have no idea how much longer it will last."—No wonder there are over a million satisfied users of KRISS-KROSS in America to-day!

Sharpens Any Make of Razor Blade

KRISS-KROSS works on practically any known make of razor blade, single or double edge, (except Durham). Gives excellent results with Gillette, Gem, Valet Auto-Strop, Keen-Kutter, Enders, Ever-Ready, Darwin, Schick, Christy and over 2 dozen others.

GET FREE OFFER

And now—to introduce this sensational device that makes old blades keener than new—we are giving with it FREE an amazing new kind of razor. Instantly adjustable to any angle. Comes with 5 new-process blades. Find out all about this astonishing introductory offer. No obligation. Just fill out and mail the coupon above to-day!

RHODES KRISS-KROSS CORP., Dept. E-3543

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World's Largest Mfrs. of Mechanical Stroppers

Canadian Address:
CANADIAN KRISS-KROSS CO.
39 Wellington Street East, Toronto 2, Canada

DO IT NOW

AGENTS! $5 - $15 An Hour

Make big money with KRISS-KROSS! It is sold only through authorized agents who are making up to $200 a week and, in some cases, even more! All you do is demonstrate and take orders for this unique invention which is heavily advertised, but never sold in stores. Nine out of ten men want it as soon as they see how it works. R. S. Hopkins (Michigan) made $50 his first day. Spare time workers, factory men, mechanics, etc., often make $6—$12 extra a day just showing KRISS-KROSS to friends and fellow-employees. Generous commissions and bonus. No obligation. Get details and liberal proposition today. Check bottom line of coupon above and mail it now!

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Earned $500 Spare Time

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Becomes Radio Engineer in One Year

Claude DeGrave, Canada: "I knew nothing about Radio when I joined the Association a [redacted]. I am now a member of the engineering staff of the DeForest Company and my income is 225% greater than at the time I joined."

Doubles Income in 6 Months

W. E. Thon, Chicago: "You have an excellent plan. Six months after I enrolled I secured the managership of large Radio store and doubled my [redacted]."

EACH of these Association-developed plans a big money-maker. Set owners everywhere want their sets modernized, freed from static, made to operate electrically, transformed into single dial controls. Learn to render these services and you can easily make $3.00 an hour spare time, to say nothing of the money you can make installing, servicing, repairing, building radio sets and selling supplies. Our members cleaning up! You can do the same.

Join the Radio Association

A membership in the Association will give you the training you need to render these services,—that will enable you to earn $25 to $75 a week spare time—train you to install, repair, build all kinds of sets—start you in business without capital—prepare you for the $3,000 to $10,000 big-pay radio positions—help you secure a better position at bigger pay for you—give you the privilege of buying supplies at wholesale. **A membership need not cost you a cent.**

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To limited number, we will give Special Memberships that may not—need not—cost you a cent. To secure one, write today. With the details we will send you copy of our Radio Idea Book that will open your eyes. Mail the coupon now.

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City State.....

Higher Accountancy—

What does it offer you?

What 15 LaSalle-Trained Accountants Reported During a Single Week!

"I have enjoyed every minute of the work. It has been a wonderful education for me, and will mean the making of a great success."
Glen Black (Ontario, Canada)

"I want to thank LaSalle for the excellent knowledge and coaching received throughout the entire course. You have given me one big thing in life, and that is a desire to promote myself in business."
Jack Cohen (Shanghai, China)

"I was successful in passing the Spring examinations in this state."
Charles Pichetti (Missouri)

"I was successful in passing the C. P. A. examination, and have received my certificate."
F. H. Chant (Massachusetts)

"I not only passed the examination but have been notified that I am to receive the silver medal awarded by the Illinois Society of Certified Public Accountants for passing with honors."
Benton W. Powell (Illinois)

"Passed the California C. P. A. examination held last November."
T. H. Mugford (California)

"Your course was a great help to me in preparing for the C. P. A. examination."
Charles Silep (Indiana)

"Not only was I successful in passing the last Manitoba intermediate examination in Accountancy but also had the honor of receiving the W. A. Henderson silver medal, a local award for the best all-around paper turned in on the examination in question."
W. M. MacDonald (Manitoba, Can.)

"I have written nearly 100 applications to prospective employers lately. It may interest you to know that I received about 65 replies, many of them favorable. I have finally accepted a position with a large foundry in Pittsburgh, at an increase in salary, and unlimited future possibilities."
Fred W. Hill (Pennsylvania)

"My salary is greater than before taking this course. I am now Auditor of the company."
R. H. Bennett (Ohio)

"After finishing your course in Higher Accountancy my salary increased 140 per cent. I should like to apply for membership in your 100% Club."
Arthur E. Newell (Virginia)

"As one result, my husband is now Secretary and Treasurer of Warwick Laundries, Inc. We both wish to thank you for the greater prosperity which has come to us as a result of his training by your school."
Mrs. Herbert Hulse (New York)

"My present position, as Assistant Comptroller of the Ranier National Park Company, has been made possible largely through the knowledge and ability gained through LaSalle training."
D. F. Crammond (Washington)

"I owe my present position, which incidentally gave me a salary increase of over 50 per cent, to my knowledge gained from the course."
Lester G. Page (New York)

"Today my salary has increased 350 per cent as a result of taking your course—thanks to LaSalle and the untiring efforts of its associates."
Marshall R. Burson (Texas)

"Of course those cases are *exceptional!*"

We can almost hear you say it, when we tell you about a clerk who enrolled for LaSalle home-study training in Higher Accountancy and increased his income more than 250 per cent—or about an assistant bookkeeper who within seven years increased his yearly income more than 700 per cent, meantime qualifying for the position of Comptroller.

But again we say, they're not exceptional—just to give you an accurate picture of what we mean when we speak, for example, of "thousands of success-reports in the files of LaSalle Extension University," we are summarizing here fifteen reports from *Higher Accountancy members only, received during a recent single week.*

Note the enthusiasm which these men express for LaSalle training. "I have enjoyed every minute of the work," writes Glen Black. "You have given me one big thing in life . . . a desire to promote myself in business," writes Jack Cohen, out in Shanghai, China.

Note that four of the fifteen report passing the C. P. A. examinations, in as many different states—and that two others report successful progress toward that goal.

Note that six report definite promotions, one of them giving credit to LaSalle for a 350 per cent increase in salary!

Send for Salary-Increasing Plan

Do you appreciate what accountancy means in the business world? Do you realize that it is a necessary factor for the success of every business undertaking? Do you know that the expert accountant commands $3,000, $5,000, $10,000 a year and has a favored route to general executive positions?

Why let the other fellow walk away with these better jobs, when right in your own home you can equip yourself for a splendid future in this profitable profession?

Under the LaSalle Problem Method you can acquire a thorough understanding of Higher Accountancy, master its fundamental principles, become expert in the practical application of those principles—*this* without losing an hour from work or a dollar of pay.

Your training will be under the direct supervision of William B. Castenholtz, A. M., C. P. A., former comptroller and instructor, University of Illinois, member of American Institute of Accountants, and a director of the National Association of Cost Accountants. He is assisted by a staff of legal, organization and management specialists, business efficiency engineers and Certified Public Accountants.

Preliminary knowledge of bookkeeping is unnecessary. Our free book on accountancy fully explains how we train you from the ground up, according to your individual needs. Low cost; easy terms.

If you are dissatisfied with your present equipment, the coupon just below this text will bring you an inspiring story—"Ten Years' Promotion in One"—of how one man, through study at home, cleared the path to success; also the true facts about present-day opportunities in Accounting, all without obligation. The man in earnest to get ahead will find in this coupon a most profitable aid to progress.

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Opportunities: If more interested in one of the other fields of business indicated below, check here.

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( ) Modern Salesmanship	( ) Business Correspondence	( ) C. P. A. Coaching
( ) Traffic Management	( ) Credit and Collection Correspondence	( ) Business English
( ) Railway Station Management		( ) Commercial Spanish
	( ) Banking and Finance	( ) Effective Speaking
( ) Law—Degree of LL. B.	( ) Modern Foremanship	( ) Telegraphy
( ) Commercial Law	( ) Personnel Management	( ) Stenotypy—Stenography

Name . . . . . .

Present Position . . . . . .

Address . . . . . .

"They Snickered When I Got Up To Speak"

—But from the First Word, I Held Them Spellbound

THE banquet hall was crowded! Suddenly I heard the chairmans' voice say—"We will now have a few words from Mr. Byron Munn." It came like a flash of lightning! He was unexpectedly calling on *me* for a speech!

As I started to get up, I heard a titter run around [illegible]

"Watch him make a fool of himself," I overheard someone whisper. "He's so bashful he's afraid of his own voice."

I knew they were expecting *me* to make myself ridiculous, but I only grinned inside.

I stood squarely on my two feet and [illegible]

"But When I Commenced to Speak"—

Almost from the first word the smiles and derision faded from their faces. They were incredulous—amazed! Instantly the atmosphere became so tense that you could have heard a pin drop! No snickers nor sneers *now!* My voice, clear as a bell—strong, forceful, unfaltering—rang out through the banquet hall as I hammered home each point of my message with telling strokes! I let myself go—soaring to a smashing finale that almost brought them to their feet!

When I finished, there was an instant of dead silence! And then it came—a deafening wave of applause rolling up from one hundred pairs of hands—spontaneous, excited, thrilling!

Was Once a "Human Clam"

After it was all over, Jack Hartray fell into step beside me as I left the hall. "Gee, that was a great speech!" he said enthusiastically. "You certainly raised yourself about 100% in the eyes of every person in that place tonight. . . . And yet they used to call you 'a human clam'—and the quietest man in the office!"

It was true too. All my life I had been handicapped with a shy, timid and retiring nature. With only a limited education I never could express my ideas in a coherent forceful way. As a result I saw dozens of men with less ability pass me by simply because they were good talkers and knew how to create the right impression. It was maddening.

A Lucky Accident

At last I accidentally ran across a little book entitled *How to Work Wonders With Words*. Between its covers I discovered certain facts and secrets I had never dreamed of! Difficulties were swept away as I found a simple way, to overcome timidity, stage-fright and self-consciousness—and how to win advancement, popularity and success.

Today I hold the sort of position that I had always envied. My salary has been increased! I am not only in constant demand as a speaker in public but I am asked to more social affairs than I have time to attend. To sum it all up, I am meeting worth-while people, earning more than I ever dared expect and enjoying life to the fullest possible degree! And furthermore, the *sheer power of constructing speech* has been the big secret of my success!

What 20 Minutes a Day Will Show You

How to talk before your club or lodge
How to address board meetings
How to propose and respond to toasts
How to make a political speech
How to tell entertaining stories
How to make after-dinner speeches.
How to converse interestingly
How to write letters
How to sell more goods
How to train your memory
How to enlarge your vocabulary
How [illegible]come stage fright
How to develop self-confidence
How to acquire a winning personality
How to be the master of any situation.

The experience of Byron Munn is typical. Not only men who have made millions, but thousands of others have found success after learning the secrets of powerful, effective speech. Being able to say the right *thing* in the right *way* at the right *time* has perhaps been responsible for more brilliant success than any other one thing under the sun.

Get This Amazing Book FREE!

Right now, we offer to send you absolutely free, a copy of *How to Work Wonders With Words*. This remarkable little book will show you how to develop the priceless "hidden knack" of effective speech that has brought success, social position, power and wealth to so many. It will open your eyes to a new realization of what life holds in store. See for yourself! There is no obligation. You can obtain your copy free by just [illegible]

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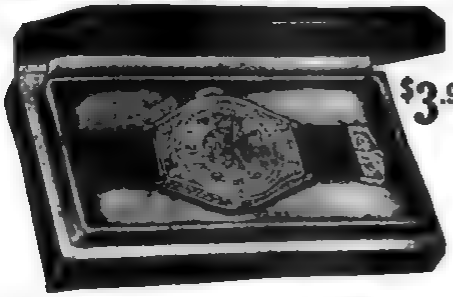


$3.99

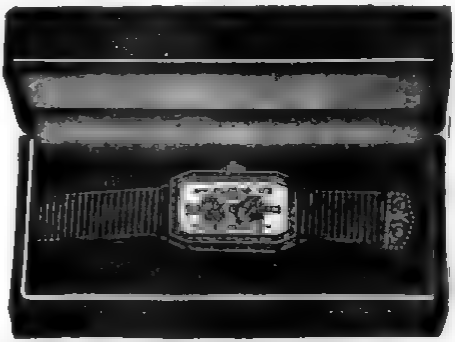
Really the Greatest Bargain in America Today

Storekeepers and Installment Mail Order Houses charge $12.00 for this very watch—We import watches direct from Switzerland and give you the benefit of our savings. Absolutely the newest, dainty, fashionable, ladies' watch. White Gold finish, engraved case, fully jeweled movement—Silk gros-grain ribbon for day wear and white gold effect link bracelet for evening and party wear. An accurate timekeeper and a Bargain at $3.99. Send No Money Pay on Delivery Fill in Coupon below.

Our Written Guarantee with Each Watch

We guarantee each and every watch to be in first class, accurate, time-keeping order, and with proper use and care to remain so for a lifetime.

We guarantee to refund money in full, or replace any watch that does not prove perfectly satisfactory to you in every way.

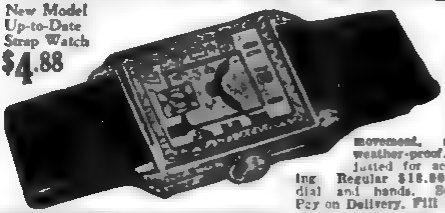


NEW DESIGN WRIST WATCH RECTANGULAR SHAPE **$4.96**

Everyone will admire this elegant and artistically designed small and narrow shaped 6 jewel wrist watch. Platinoid or white gold effect case, handsomely engraved finish top, gracefully carved sides. Fitted with genuine Swiss movement of the finest quality, guaranteed for accuracy and dependability. Every wheel, spring, screw and jewel flawlessly finished. Furnished with two bracelets; a black silk gros-grain ribbon for day wear and a white gold finish link bracelet for evening and party wear. A real $20.00 value. Send No Money. Pay on Delivery. Fill in Coupon.

New Model Up-to-Date Strap Watch

$4.88



Your choice in square, rectangular or tonneau shape at same price. White Gold effect richly carved case, with extra-fine Swiss 6 Jewel movement, shock-proof and weather-proof. Tested and adjusted for accurate timekeeping. Regular $18.00 value. Radium dial and hands. Send No Money. Pay on Delivery. Fill in Coupon below.

$3.59

This Men's Pocket Watch—Knife—Chain and Pistol Cigar Lighter Combination separately would retail for over $15.00.

Here's an opportunity to buy this combination for only $3.59. Pocket Watch is an extra thin model—Beautifully engraved case, white gold finish—Handsomely designed dial with vision letters—*jeweled movement* and really a perfect timepiece. Comes to you with the latest style of *Waldemar chain and a fine gold plated knife*

The Cigar Lighter charm at the other end of the chain is a unique but practical cigar lighter and will delight you because of its artfulness and of its usefulness. Order this $15.00 combination today at the Bargain Price of $3.59.

SEND NO MONEY

Pay on delivery. Fill coupon

Lifetime Precision Men's Strap Watch

$3.99

Worn by Practical Men Everywhere — Guaranteed shock proof and weather proof — Perfect timekeeper—Radium Dial —Tells time in dark—Fine imported full jeweled movement — Silver finish — Genuine leather strap—Absolutely a $16.00 value. Fully guaranteed to give you complete and entire satisfaction. This is not a cheaply constructed domestic watch, but a real timepiece. Send No Money. Pay on Delivery. Fill in coupon.

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Gentlemen: Kindly ship me C. O. D. the following advertised articles (Check articles desired!).

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—New Design Rectangular Watch.....$4.96
—Men's Watch, Chain, Knife and Pistol-Lighter.....$3.59
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—New Model Up-to-date Men's Watch.....$4.88

Name .....

Street .....

City..... State.....

They Laughed When I Sat Down At the Piano But When I Started to Play!—

A [illegible] ense. Then to the amaze[illegible]als, I struck confidently [illegible] down [illegible] some melody chack[illegible]ed [illegible] were all certain [illegible]gle note.

I heard a girl whisper to [illegible] exclaimed. "He never [illegible]" [illegible] e most of the situation. With mock [illegible] drew out a silk handkerchief and lightly [illegible] keys. Then I rose and gave the revel[illegible] no stool a quarter of a turn. The crowd [illegible]ed merrily. Then I started to play [illegible] tense silence fell on the guests. I played [illegible] first few bars of Liszt's immortal "Liebestraum" and heard gasps of amazement. My fingers [illegible] breathless—spellbound! I played on.

A Complete Triumph

As the last notes of "Liebestraum" died away [illegible] rapid questions . . . "Jack! Why didn't you tell us you could play like that?" . . . "Where *did* you learn?"- "Who was [illegible]" I have never even *seen* my teacher," I replied. And just a short while ago I [illegible]

"Quit your fiddling," laughed Arthur, himself an accomplished [illegible] "You've been [illegible]

PICK YOUR INSTRUMENT	
Piano	Cornet
Organ	Piccolo
Violin	Clarinet
Drums	Trombone
Flute	Harp
Cello	Ukulele
Mandolin	Saxophone
Hawaiian Steel Guitar	Trombone
Voice and Speech Culture	Piano Accordion
Automatic Finger Control	Banjo

[illegible] "I insisted. "I kept it a secret [illegible]

No Teacher Needed

"It seems just a short while ago that I saw an ad of the U. S. School of Music mentioning a new method of Larnin to play which made it unnecessary to have a teacher. The ad told how a woman had learned to play the [illegible] quietly at home in her own spare time. It concluded with a strong statement that I balked at. It said that anyone [illegible] was able to play [illegible] instrument by note in a few months' time. [illegible] was a pupil. I liked [illegible] I soon will be able to play classical numbers or jazz [illegible] as I choose. And I do have any special talent for music!"

Play Any Instrument

You, too, can now learn music right at home the same [illegible] You can't go wrong with this modern method which has already shown over half a million how to play their favorite instrument by note. No old-fashioned [illegible] "hard to learn" about it. Just read the list of instruments in the panel above and decide which one you want to play. Then the U. S. School will do the rest.

Send for Free Booklet and Demonstration Lesson

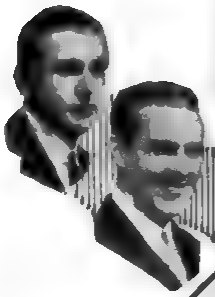
Several interesting booklets have been published explaining the [illegible] method. One of these booklets, entitled "How to Learn Music at Home," will be sent free with our interesting Free Booklet and Demonstration Lesson. The booklet will tell about the [illegible] method. Instrument [illegible] Special [illegible] arrangement [illegible] Don't delay. Just mail the coupon below, or write, and the booklet and free lesson will be sent promptly. No salesman will call on you. Address your request to U. S. School of Music, 2625 Brunswick Bldg., New York City.

U. S. School of Music, 2625 Brunswick Bldg., New York City

Please send me your free booklet, "How to Learn Music at Home," with introduction by Dr. Frank Crane, Free Demonstration Lesson and [illegible] explaining your easy payment plan. I am interested in the following course:

[illegible] Have you [illegible]

Name [illegible]



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Share, at once, the Success of a Nationally Known Business

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Carlton Mills *guarantees* you a proposition *big enough* to justify your full time but *generous* enough to welcome your spare hours. Every minute means money. You work with *Ambition* as your boss and your success is dependent only upon your willingness to *forge ahead*—nothing more.

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When you *see* your elaborate sample book (the coupon brings it) with actual fabrics and full details, you'll understand why the winning of orders becomes only a *pastime* thanks to the Carlton sample book.

The Carlton proposition *sparkles* with opportunity. You'll find it so—and you'll instantly concede that it is worthy of best endeavor full or spare time . . . So let's go!

Complete Sample Outfit Furnished FREE

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Act via the Coupon—Today! . . . Quick action quickens the results and you've Carlton's guarantee that these results will be highly profitable to you!

Fill out and Mail the Coupon—just below

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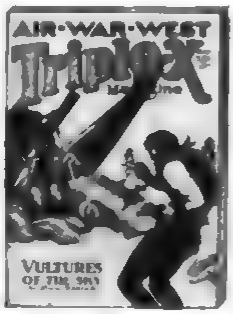

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Clayt Vreeland—as I am today See my head of hair.

One Full Ampoule of amazing hair fluid which I discovered myself and which grew hair on my head.

This Ampoule is absolutely free. Don't send any money. There is no C.O.D. No charge whatsoever. All I want is an opportunity to show you how easily I grew hair on my own and hundreds of other men's heads. Merely mail the coupon below for Free Ampoule.

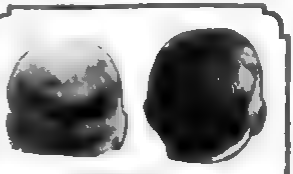
Bald Headed Clayt Vreeland as he used to be. Light

Here Is How I Used to Look

I was just as bald as this picture. It is a true photograph without any tampering or retouching. It is exactly as I used to look. Then look at the full head of hair I have in the picture on the left! . . . As I have stated so often, I don't know whether I am the first man who discovered this great secret, but I do know I have it, that I grew my own hair and that I am growing hair on the heads of other men

Bald Men
Grow Hair *Quick!*

What I accomplished on my own head and on other heads I can do for you, provided you are under 45 years of age and loss of hair was not caused by burns or scars. Anyhow, I must succeed or you pay nothing. No apparatus. My home treatment is simple, quick, inexpensive.



Here is Brennan
Brennan while he was bald.
And Brennan after Vreeland grew his hair. Write and I will tell you Brennan's story and give you his address.

Here is Wiseman
Wiseman was bald like this
But Wiseman grew this head of hair with my wonderful hair growing fluid. All about Wiseman and how he did it. If you write You will get his address, too.

Mail This FREE Coupon!

Mail the coupon today—Right Now—I will send you, immediately, one full Ampoule of my marvelous fluid which I discovered, of which I hold the secret and which grew my own hair on my own bald head.

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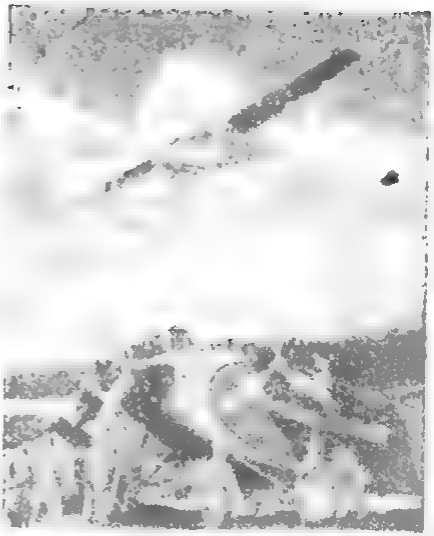

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[illegible] bile industry. It [illegible] ground floor"

[illegible] **kind of a chance** [illegible]

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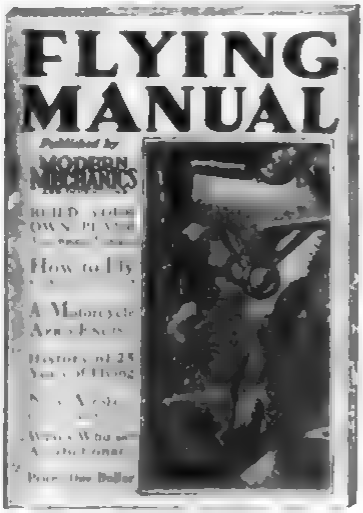

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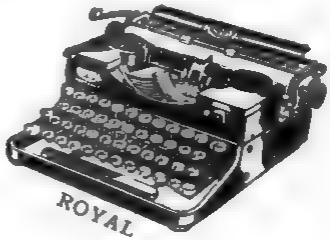

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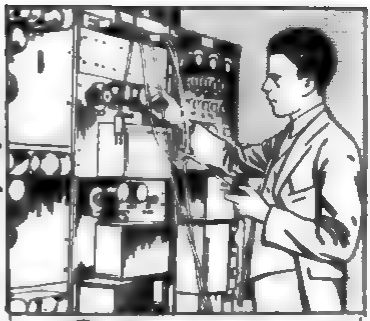
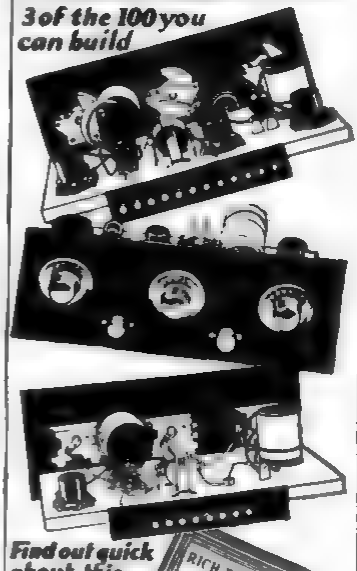
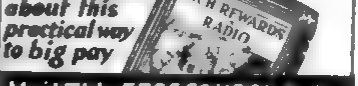
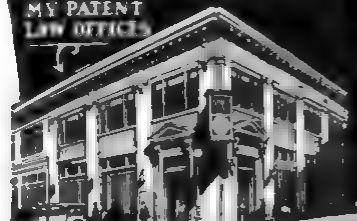


You can build 100 circuits with the six big outfits of Radio parts I give you

3 of the 100 you can build







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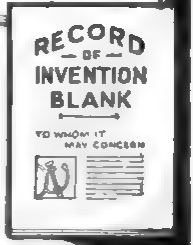

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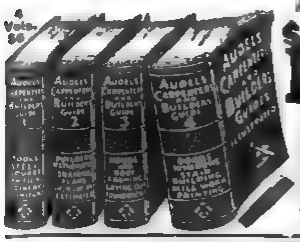

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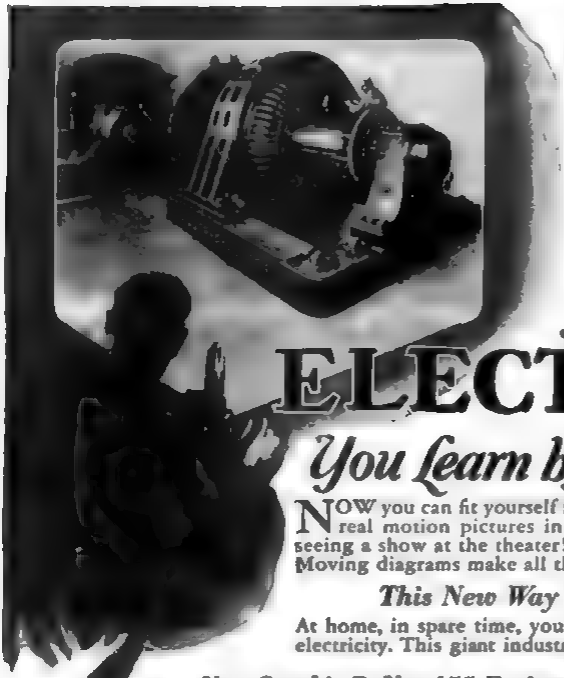

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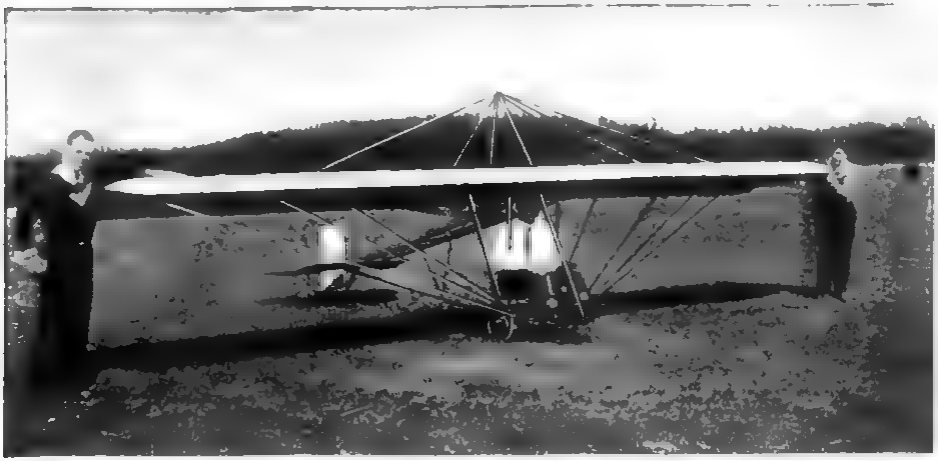


Symbolic of another giant industry in the making is the glider above, built from Modern Mechanics plans. As outlined in the editorial below Modern Mechanics is publishing these hobby projects so young men will be better fitted to recognize their opportunity when they see it.

Opportunity and You

YOUNG men standing on the threshold of their careers often say, "Opportunity is dead. There aren't the chances for making money that there once were."

No assumption could be more false. It is always true that the chances of a man's making a huge fortune are highly problematical. But because Fate in the past saw to it that the Bessemers, Rockefellers, Garys and other Titans of industry were presented with their opportunities does not mean that Fate in the future will not repeat.

Opportunities are knocking today as they have never knocked before. Every universally accepted invention calls forth thousands of allied needs. In the automotive and electrical industries men have conjured forth fortunes from opportunities which were nonexistent thirty years ago.

Today, the field of aviation is bristling with opportunities such as the Titans never dreamed of. Chemistry is praying for a thousand secrets to be solved, and will pour wealth into the laps of the men who can present these secrets to the world. So everywhere in any branch of the physical and mechanical sciences.

It is easier to name the opportunity than it is to name the man who can recognize and capitalize the opportunity to the utmost. It is easier to name the what, the how and the why than the who and the when. Says Julius Rosenwald, multimillionaire:

"I believe most men of wealth stumbled into their fortunes. They recognized their chance, realized they were placed in a favorable position, and made the most of it."

The secret of "making the most of it" seems to lie in preparation—ability to recognize the right chance.

To show what wonderful opportunities exist today, Modern Mechanics has scheduled a series of articles surveying vocational opportunities in many lines of endeavor. These articles are aimed at orienting young men and preparing them to recognize opportunity when they see it in whatever field is to their liking.

Many successful automotive men had their start by being in touch with just such information as is contained in "Perils and Rewards of Racing," on page 88 of this issue. Rickenbacker, Wills, Ford—to mention a few.

Follow this series—it will prove that opportunity is not dead! As Owen Young says, "Keep your powder dry, take steady aim, and you should score a bull's-eye."

A Non-Stop World

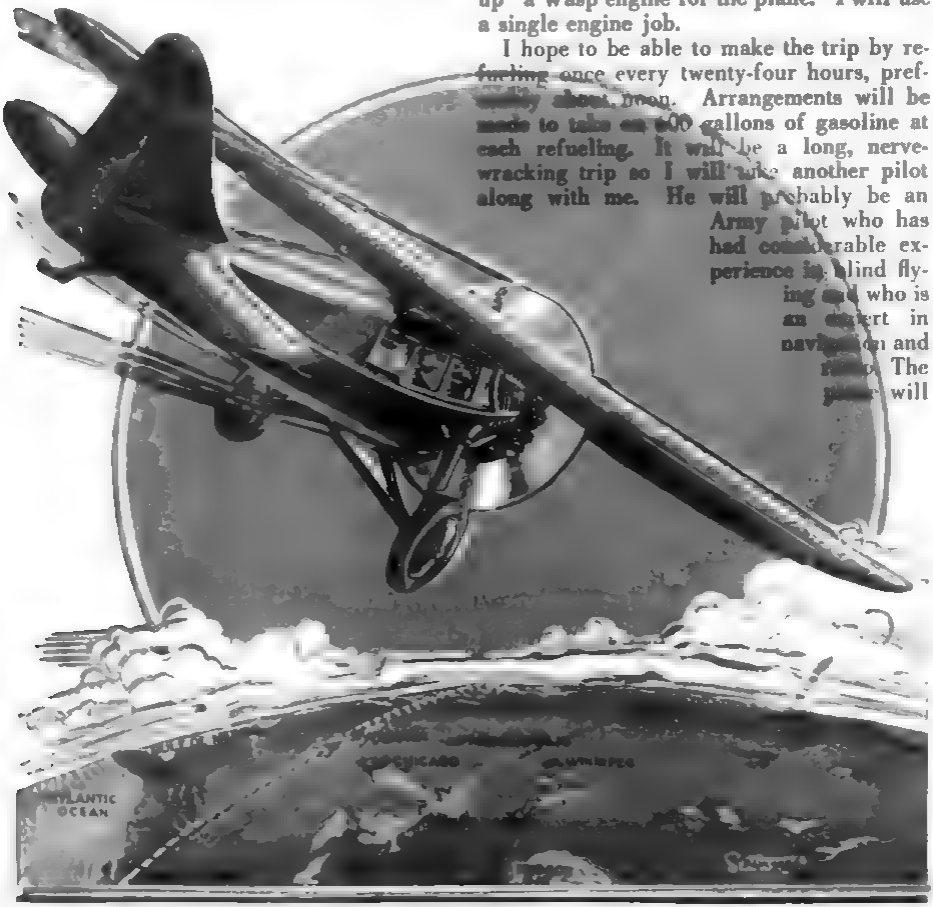
as told to MAJOR H. H. ARNOLD

by COL. ARTHUR C. GOEBEL

LYING on a bed in a hospital in Wichita, Kansas, recovering from appendicitis, Colonel Arthur C. Goebel gave the following information relative to his proposed non-stop refueling flight around the world:

The cost of such a trip will be in the neighborhood of $300,000.00. I figure the minimum cost of such an expedition at $225,000.00. I will use a plane manufactured in Wichita, if possible, a Cessna or a Lockheed Vega cabin type. I expect to get the Pratt and Whitney Company to "pep up" a Wasp engine for the plane. I will use a single engine job.

I hope to be able to make the trip by refueling once every twenty-four hours, preferably about noon. Arrangements will be made to take on 600 gallons of gasoline at each refueling. It will be a long, nerve-wracking trip so I will take another pilot along with me. He will probably be an Army pilot who has had considerable experience in blind flying and who is an expert in navigation and radio. The plane will



Col. Goebel plans to use a single motored ship in his proposed non-stop flight around the world, carrying a reserve pilot and refueling every day at noon with six hundred gallons of gas after the manner used by the crew of the "Question Mark."

Flight

Col. "Art" Goebel is probably as well fitted a man for winning the greatest of all air honors as America could send after the mark. His proposed non-stop flight around the world is the subject of greatest interest at present, and we are proud to present this interview with him by our Aviation Editor, Major H. H. Arnold.

Col. Arthur C. Goebel, breaker of air records and pilot extraordinary, who in this exclusive interview by Major H. H. Arnold gives his plans for making a non-stop world flight.

be equipped with a compact, light, radio set.

The route I expect to follow will start at Wichita. I will then fly over the Great Lakes, across Canada, over the North Atlantic to Greenland and Iceland. I expect to reach Europe somewhere near the centre of the Norwegian coast line. From there my flight will take me across Northern Europe, Siberia and the Behring Strait to Alaska. Once having reached Nome my flight will take a southeastern course back to Wichita.

Here are some sidelights on the flight. As yet it has progressed no farther than a paper study. No definite refueling points have been selected nor is there any known plane which can transfer 600 gallons of gasoline and the required oil every 2,000 or 2,400 miles. It is obvious that much hard work, careful planning and many details must be consummated before attempts can be made to even start construction of the plane.

I am very much interested in the reports coming from Paris which indicate that a Fokker plane will leave Paris on a refueling non-stop flight around the world.

Both expeditions hope to be able to start their planes next Summer. Accordingly in a way it will be a non-stop race around the world. If either plane makes the trip successfully, the greatest feat ever accomplished in aviation will be history.

The routes selected are both marked by long stretches of bad flying terrain. My route is about 2,000 miles shorter than that selected by the French. On the other hand, it requires that I fly over unbroken forest areas of Canada, frozen, barren, bleak northern Russia and Siberia and the rugged mountains of Alaska. The French route crosses the desert area of southwest Asia, the tropical jungles of southeast Asia and the unbroken mountain ranges of Alaska.

In crossing the oceans, I have the advantage of the land of Greenland and Iceland. The French expect to make a non-stop flight around the world, finishing by making a dash straight across the Atlantic.

I am aware of the many difficulties confronting me but I have confidence in my flying ability, and I do not think that I will have any difficulty in securing a plane which will be equal to the almost impossible flight.

FACTS ABOUT THE PROPOSED FLIGHT

Single motored ship will be used.
Flight refueling to be resorted to. transferring 600 gallons from supply ship to non-stop plane each noon, or every 2,400 miles.
Most of route over frozen inaccessible country.
Will start and end at Wichita, Kans.
Col. Goebel will use a relief pilot.
Will take 10 days constant day and night flying.
Will cost $300,000 to finance.

Photograph Atoms in University Laboratory

IF SOME of the earlier scientists ever dreamed that atoms could be photographed, it was probably in their more enthusiastic moments. Yet that is exactly what Prof. William D. Harkins, of the department of chemistry of the University of Chicago, is shown doing.

The university instructor has perfected an apparatus for photographing the tracks of atoms. Moving pictures are taken of the synthesis of an atom of oxygen from a lighter atom of nitrogen, which gives a still lighter atom of hydrogen, by disintegration.

Movement of the atoms is so fast that only one or two pictures will show results out of 100,000 trials. The camera's lens is necessarily highly magnified to record the minute particles on the sensitive plate.

HIGH PRICED ALLIGATOR

THE market quotation on white alligators is $333.33 per foot, according to W. J. Godfrey, manager of a South Jacksonville alligator farm.

Mr. Godfrey has a six-foot specimen, believed to be the only white 'gator ever captured in Florida. He has offered it to the English Zoological Society of London, for $2,000, and the society has sent a representative to examine the reptile.

The 'gator was raised on the farm, which is one of the largest in Florida.

USE WASTE PRODUCTS

A HANDFUL of sawdust, a cull potato and a lump of waste coal comprise the sole raw materials of a manufacturing plant in Spokane, Washington.

Motor fuel with an alcohol base, several types of smokeless fuel, industrial and commercial gas, fertilizer, denatured alcohol, and a host of wood and coal tar products are some of the things that are made.

Utilization of materials that would ordinarily be thrown away as waste is probably the most striking feature of the plant. Through special treatment of this material, a variety of products may be produced at a comparatively small cost.

The carbonization of coal is brought about by using low pressure, superheated steam as a supporting medium without application of any exterior heat.

FEW PUMPS LIKE THIS

FIVE little buckets hang around this pump. When the handle is worked, the liquid in the well flows from the spout. The apparatus has no particular name, and its use is left entirely up to its owner.

The pump is made of plate silver and stands 16 inches high. It has a capacity of two quarts and is filled from a special opening.

One of its best features is the thermos lining on the interior. This makes it possible to keep hot or cold liquid in the pump for several hours without any change in temperature.

Miss Helen Case demonstrating novel pump.

Children Learn to Run Typewriter in First Grade

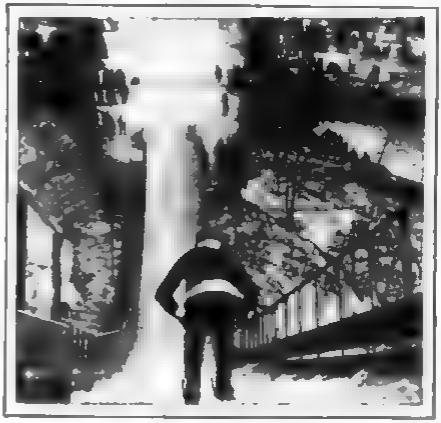
NEW YORK school authorities are experimenting with a new phase of elementary instruction in the Horace Mann school, New York City. Children of the first grade receive typing lessons as a part of the regular school curriculum.

It is the theory of educators who are performing the experiment that such instruction, while children are beginning to learn the alphabet, will be exceedingly easy for them to master.

Young students will be aided in their spelling lessons by use of typewriters. They will be enabled to spell and visualize words at the same time. Instruction in handwriting will not be abandoned, and the youngsters will have an equal amount of training in both subjects.

They will learn the touch system at the very start and will be able to operate a machine expertly before they reach the fourth grade. This will not only be a great help in the remainder of their school work, but is expected to be of immeasurable value in preparing them for work.

Dr. R. G. Reynolds, principal of the school, asserts that introduction of the typewriters is not intended to influence students toward typing as a career.



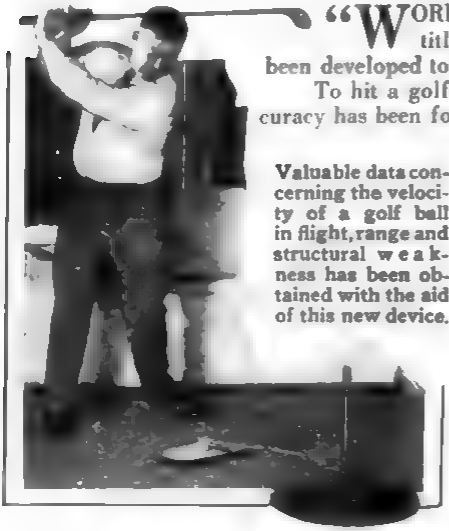
ALL SET FOR A FLIGHT

ALL FLIERS don't use planes to cruise around the air. Rudolph Gunderson, of the Norge Ski club, Chicago, is shown just about to take off for a flight during competition in one of the final meets before the snow melted.

The structure is over 200 feet high and is built on a hill, easily sending the jumpers spinning through the air.

Mrs. M. Meadowcraft, teacher of typing, is shown supervising some of her first grade pupils.

Tests Structure and Velocity of Golf Ball in Flight



Valuable data concerning the velocity of a golf ball in flight, range and structural weakness has been obtained with the aid of this new device.

"WORLD'S most perfect golfer" might be the proper title for the apparatus shown at the left. It has been developed to test golf balls in flight.

To hit a golf ball twice with exactly the same force and accuracy has been found practically impossible for a human being to accomplish. This machine, however, will deliver a mighty blow as many times as desired. It never slices or tops a ball.

FLYING BOAT TESTED

SUCCESSFUL tests of the new navy flying boat, Admiral, were recently conducted at the naval air station at Anacostia, D. C., with Edward P. Warner, Assistant Secretary of the Navy for aeronautics, in the pilot's seat.

The craft was hailed as the forerunner of fleets of flying boats to be operated on air lines above water. Orders for additional ships of the same design, but converted into 32 passenger air liners, are contingent upon the navy's tests with the Admiral.

MUSEUM GETS GUN WHICH FIRED FIRST U. S. SHOT

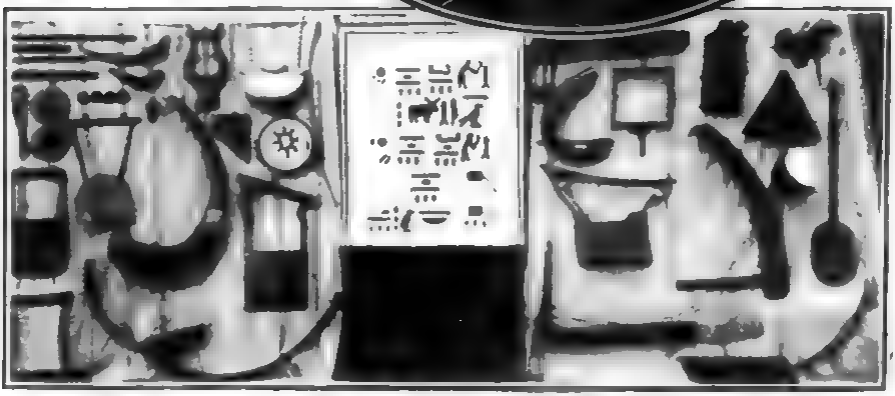
THE gun that fired the first American shot in the World war has been placed on exhibition at the Smithsonian museum at Washington, D. C. The gun was mounted on the after-deck of the S. S. Mongolia and was fired at a German sub April 19, 1917.

Primitive vs. Mechanical Music

STONE age men produced music by tapping a stretched hide. Today we press a button, and presto—music!

White horsehair is used in making violin bows. Above a worker is sorting horsehair for quality.

The mechanical violin whose mechanism is exposed above is one of the latest advances in the development of mechanical music. Fingering of the violin is done by the M-shaped rod, while the bow is moved by the same mechanism which twists the violin around to present the proper strings to the bow. A perforated roll, shown at the right, controls the machine.



Music making devices from Biblical times. Note the predominance of stringed instruments.

The artist has shown how oil well fire fighters placed a steel hood weighing a ton over the top of a flaming "gasser," as described in the article on the opposite page. This operation was done after miners had tunneled down to the underground casing and drawn off a large quantity of the escaping gas by means of a lead-off pipe attached 50 ft. below surface.

Fighting Oil Fires With Mud and Steam

By RAY ALLAN

Tunneling 50 feet beneath the surface of the earth to tap the casing of a burning oil well, California firemen subdued the fierce flames by injecting a mixture of mud and live steam into the heart of the flaring well.

WHEN nature goes on a rampage and expresses her feelings in the form of a gas or oil blowout in the oil fields, the fire which frequently accompanies the upheaval would tax the resources of a metropolitan fire department. In fact, the fire fighters of New York City would probably be helpless under such circumstances, because they are accustomed to using water, while oil field firemen rely largely upon mechanical resources.

Within the last few weeks Southern California has experienced two fires, one of which was not subdued for 42 days. Both fires resulted from gas blowouts while wells were being drilled to the 6,000-foot zone at Santa Fe Springs. The first fire, occurring at the Getty No. 17 well, involved oil and gas, while the Bell View No. 2 fire involved more gas than oil.

No two oil well fires are alike, for the reason that the blowouts result from many different causes, and so no two gassers can be combated by the same tactics. Out in the wide open spaces, where derricks are far apart, the field men may use dynamite to snuff out a gasser. They attach the explosive in the center of a long cable, and with crews at either end they carry the string, high over their heads, to a point where the explosive dangles right over the casing of the well. The heat touches off the dynamite, and the sudden puff downward blows out the fire.

In the case of the Getty fire the operating companies, after a lengthy conference, decided against using dynamite. The tunnel plan used in this instance will, with modifications to meet existing conditions, probably serve the oil industry for a long time as a basis for handling such fires.

At a distance of about 350 feet from the gasser, a tunnel was started on an incline calculated to give it a depth of 50 feet at the casing. The miners worked with power shovels, and the dirt was rolled out on small cars. Good progress was made with a hole four feet wide and six feet high until the miners got within forty feet of the casing,

This cross sectional view shows how oil well fire fighters extinguished a flaming gasser by means of an underground tunnel, a method developed for use in congested oil fields.

A big oil well fire disrupts operations in entire field. Note how insignificant is the defense of a fire hose.

At the left is shown a striking view of the Getty gasser fire described in this article. Derricks in the neighborhood were felled to prevent spread of flames. Note the pools of oil on the ground. Above is a night view of a flaming well, visible for hundreds of miles.

where they hit quicksand, which caused caving and compelled them to build concrete walls.

When the casing was reached a large concrete room was built around it, so the machinists could work on all sides. The oil well had 15½-inch surface casing with 11-inch casing inside that, 9-inch inside the 11-inch, and a 4-inch drill pipe inside the 9 inch casing. Drilling through the outer casing, the miners took acetylene torches and cut off the outer casing from the ceiling to the floor.

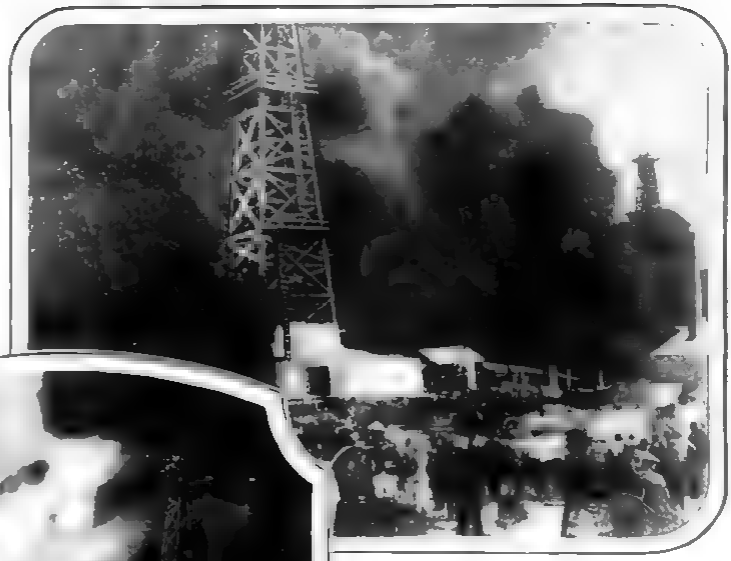
Drilling through the 11-inch, they used bolts to crowd it over to center, and then pumped in cement until they had filled up the space between the 11-inch and 9-inch. Then they stripped off a section of 11-inch, and put on clamps at cellar and floor. These clamps were made in two pieces, which bolted right around the casing. In the center of each clamp, on one side, was a threaded hole, into which pipe could be screwed. They connected pipe to these outlets to take off such oil and gas as was coming up between the two strings of casing.

The next step was to drill through the 9-inch casing and center the 4-inch drill stem, through the center of which much of the oil and gas was blowing to the surface. The 11-inch was finally blocked with cement from the ceiling of the tunnel to the cellar of the derrick. Another set of clamps tapped off, through the tunnel, a part of the oil and gas in the 9-inch casing and the drill stem.

This oil and gas was sucked out of the casing, through tap lines, by a vacuum pump calculated to pump it faster than it could go up to the mouth of the well. This oil and gas went out into a scrubber which separated them and stored the oil. The vacuum pumps took off so much fuel from the fire that the blaze, which had been 200 feet high, was greatly reduced. This enabled engineers, using a steam crane, to approach the well and set over the mouth of the casing an enormous hood, weighing more than a ton.

This hood smothered the flames and

Petroleum in tanks burns as well as oil wells, as is shown in the picture at the right. Immense clouds of black smoke roll up, in contrast to the searing flames of a "gasser." The intense heat generated by a flaming gas well can be imagined from the photo below.



caused the gas and oil to flow more freely through the lines running from the casing in the tunnel to the scrubbers and tanks. Workmen then approached the hood and dug a trench to lead off the small amount of oil that was bubbling up into the hood. After a time the well quieted down so that the workmen could lift off the hood and screw a Christmas-tree valve upon the top of the casing and shut down the valve, confining the well's oil and gas flow entirely to the tunnel lines. It has been roughly estimated that the mechanical work on this job cost $250,000.

Many straight gassers can and are subdued by live steam, or heavy cement mixtures, but where the pressure is too great the cement is hurled out and the steam fails. Such a gas well may, at any time, hurl out a rock that will strike a spark when it hits against the side of the casing at its mouth, and this will start a fire that may do millions of dollars in damage.

In another instance a gas fire was successfully combated by a similar tunneling operation in which mud and live steam was injected into the casings, cutting down the flow of gas and making it possible to drop a huge steel ball into the fiery maw of the well. The sphere was injected with a mixture of mud and hematite, a granulated and crystallized type of metal. More mud was then pumped in at the top of the well, effectively smothering the flames after damage of $1,500,000 had been done.

When a fire "gets going" in a big oil field, the operators usually shut down operations and pool their resources until the flames are conquered. Fire is likely to spread to adjoining oil-soaked derricks unless immediate steps are taken. Even gas wells are likely to prove dangerous to the community if fogs blanket the gas close to the earth before the flow can be controlled with valves. A big "gasser" could asphyxiate a whole town.

$140,000.00 in Radium for the U. S.

Radium valued at $140,000 was received recently in the small glass vial shown in photo.

AN OLD time saying that "Valuable things come in small packages" was borne out recently when the United States customs officials received a shipment of radium from Congo, Africa. $140,000 in radium was delivered in the small box that is shown to the left. This box contained a special lead cylinder within which a glass tube of radium was packed. Lead is the only metal that will keep the penetrating rays of radium in check. This metal not only safeguards the people who must handle the radium but minimizes the chances of breakage.

Radium is one of the scarcest of known metals. The amount in the possession of all nations is very small. This fact, of course, accounts for its very high price. There is one redeeming feature, however; radium maintains its strength indefinitely.

The rays of this wonderful metal are used for medical purposes with remarkable results. The treatment of cancer has been materially aided by the use of its penetrating rays, which it is claimed will kill the cancer germ.

NOVEL SLEEPING PORCH

MANY families would like to have a sleeping porch on their home if the cost of remodeling wasn't so expensive. A German architect recently designed a method of attaching a sleeping porch without the usual wall removing activities.

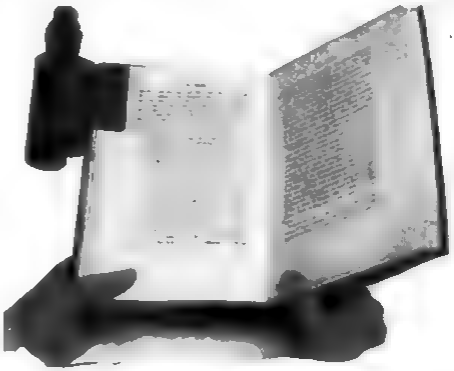
This design calls for two brackets which are attached to the wall below a window, which operation does not call for any mutilation of the wall. The porch can then be built upon these brackets. The architect drew up the plans so that the porch could be assembled upon the ground and hoisted into position. The window must then be enlarged to make a door way. This is the only part of the construction that calls for remodeling. Since the window is already nearly large enough, this fact does not entail much labor.

Reading Lamp for Sick Room Has Advantages

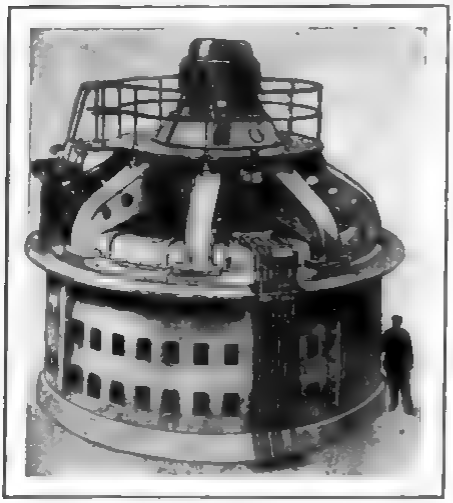
AN ELECTRIC book lamp that puts the light exactly where the reader wants it —directly on the pages—has been invented.

The light clamps to the book and permits reading in a sick room when a bright light might be disturbing to the afflicted person.

It is not necessary to change the clamp every time a page is turned. The lamp is made of extremely light metal and will not make the book cumbersome.



LARGEST TURBINE



THE LARGEST turbine in the world has just been completed in the shops of the Swedish Electric company, Vesleros, Sweden. It is of the three phase vertical type and develops a current of 10,000 volts. An idea of the tremendous size of the machine may be gained by noting the comparison of the men in the picture.

PHONE GIRLS USE SKATES

OPERATORS in Los Angeles telephone exchanges go roller skating each night. They don't have any boy friends along to pick them up when they fall, nor is their skating comprised of fancy turns and difficult tricks. Business is the primary cause of their donning skates.

After 10:30 p. m. phone calls become less frequent, and not many girls are on duty. Distances which used to keep the girls doing kangeroo jumps to plug in a call are now covered with ease.

IN MODEL EXHIBIT

MODEL locomotives were recently on display at an exhibition of the New York Society of Model Engineers in New York City.

The engine shown in the photo below is modeled on a one-third scale after a heavy Pacific locomotive. It is 73 inches long and runs on a miniature track from its own power generated in the tiny boiler.

This locomotive is not a toy. Yet what boy wouldn't give anything to become its owner? It is one of the engines in the exhibition of the New York Society of Engineers held recently in New York City. Vincent Astor is the owner of the model above.

New Movie Reel Records Sounds for Talkies

Frederick W. Hochstetter, inventor of the new movie reel sensitive to sounds, is shown demonstrating his creation.

ONE surface of this new movie reel records pictures and the other sound waves. It is the latest invention of Frederick W. Hochstetter, Pittsburgh, Pa., and is expected to be of great aid in the further development of the "talkies."

Material composing the reel consists of fabric which has been made fireproof. It is photographically light sensitive with special emulsions of great reflecting qualities.

With use of this new type of reel, motion picture producers will be able to obtain better results with less effort in filming a talking picture.

Considerable difficulty has been experienced in the past in presenting the sound of an actor's voice in perfect co-ordination with the movement of his lips. If the new device proves successful, this trouble will be eliminated, and another forward step will have been made in advancement of the industry.

NEW MINERAL AREA

DISCOVERY of a valuable mineral field in western Canada has been announced by the British Columbia department of mines. The area lies on either side of the Stikine river, in northern British Columbia, and west of Telegraph creek. Highly valuable lode minerals were found.

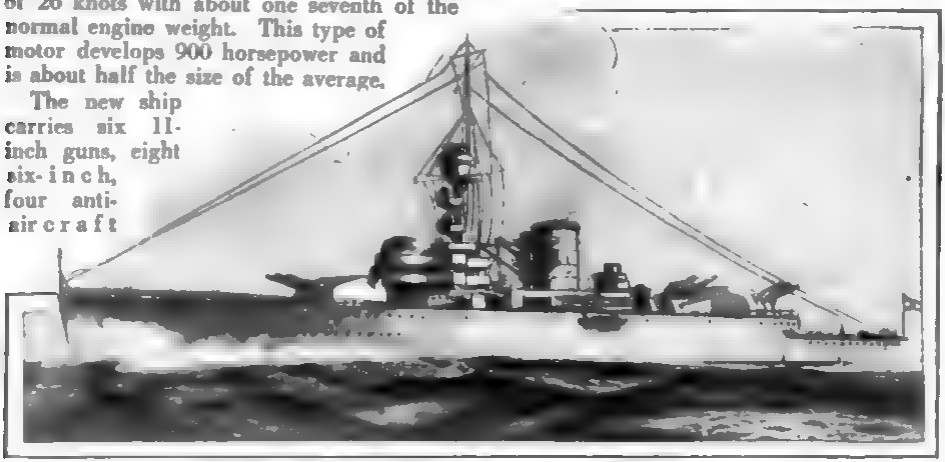
NEW GERMAN CRUISER COSTS $20,000,000 TO BUILD

GERMANY "jumped the gun" on other nations with this new cruiser built at the Kiel shipyards, Germany, at cost of $20,000,000.

Diesel motors will give the craft a speed of 26 knots with about one seventh of the normal engine weight. This type of motor develops 900 horsepower and is about half the size of the average.

The new ship carries six 11-inch guns, eight six-inch, four anti-aircraft guns and six torpedo tubes. It will have a cruising radius of 10,000 miles.

By welding plates instead of riveting them, 1,000 tons of metal was saved. The ship weighs approximately 10,000 tons.



This is the first picture of the new $20,000,000 German cruiser recently built at Kiel, Germany.

Houses Built on Stilts are Novel Lake Dwellings

ONE OF the most remarkable summer camps in the country is the colony which has been established at Milnensburg, Louisiana, in the shallow waters of Lake Ponchartrain. The photo above shows how dozens of houses have been built on piles above the water. Narrow walks starting at the mainland lead to the various cottages, which are spread out over the water to form a queer lake city. Residents in these cottages assert that the cool breezes from the heart of the lake make this form of construction worth while. The photograph was taken from an airplane.

PAY 5 CENTS; LOCK YOUR BICYCLE

A BICYCLE lock which works on the principle of a slot machine has won favor in European countries where the automobile has not displaced the two-wheeled machine in popularity. As shown in the picture at the right, the locking device is attached to the wall of a building. When a coin is inserted in the slot a stout chain is released with which the bicycle is fastened. A key is obtained at the same time.

New bicycle lock works like a slot machine.

ELECTRIC "EYE" GUARDS AGAINST FIRES

USE OF photoelectric cells as "eyes" which guard against fire, sort packages, and perform various other almost human stunts, was demonstrated recently by officials of the Westinghouse Electric Company. As a demonstration, a pail of gasoline and kerosene was set afire. Immediately the watching eye set up an electric impulse which caused a fire extinguisher to be played on the surface of the pail, putting out the flames. Another electric cell, given the task of counting packages as they passed before it on an endless belt, proved the acuteness of its vision by yanking out packages which were not properly labeled.

25 Men Died to Film

The above scene of actual trench warfare was taken by a German cameraman who was later killed in action. Note the "potato masher" sailing through the air in the background.

Struck down in action, these two German soldiers are desperately trying to help one another to a place of safety from enemy fire.

ONE hundred motion picture cameramen, officially assigned by the imperial German government of the ex-kaiser to film German troops in action during the great war, were required to take the remarkable war scenes now being shown in theaters throughout the country under the title, "Behind the German Lines." Of these cameramen, 25 were killed in action, many of them dying with their hands on the cranks of their movie cameras. These are actual battle pictures, taken in the heat of conflict; the movies show bursting bombs, soldiers struck down while charging across no-man's land, shrapnel and hand grenades exploding in dangerous proximity to the cameras.

The battle of Tannenberg, the battle of Ypres, and a remarkable action picture of Baron von Richthofen, the "Red Knight" of the German air forces, shooting down an allied plane, are high spots in the production, which stands as Germany's official record of the war. The pictures of Richthofen were secured only by accident, the cameraman chancing to be flying in the vicinity at the time.

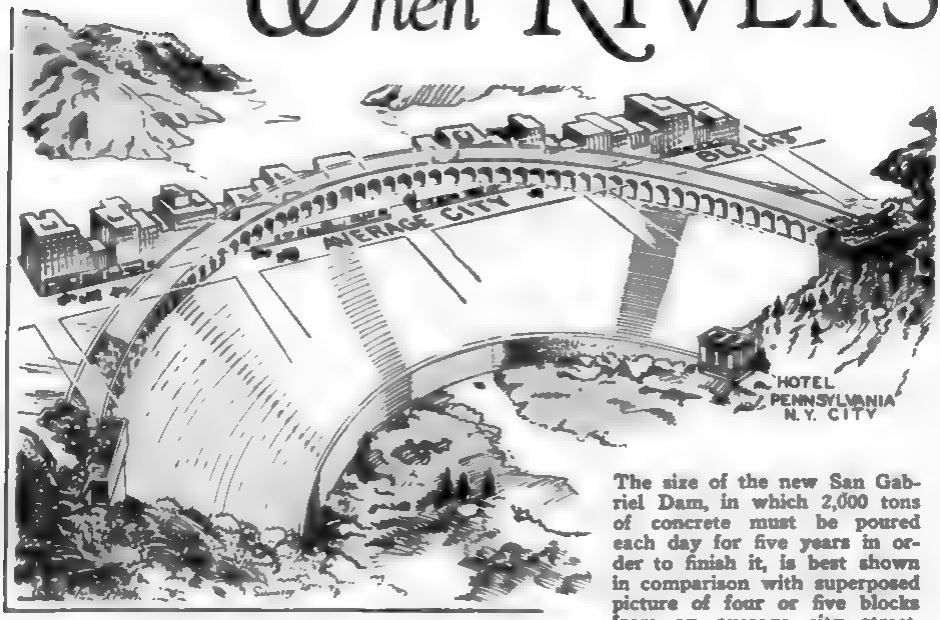
these War Movies!

Over the top! None of the men crawling through the barbed wire entanglements returned to tell the tale, being cut down by merciless Allied fire. It is a graphic illustration of the effectiveness of barbed wire in hampering the advance of troops through no man's land.

This German was snapped in the very act of hurling a potato masher grenade at advancing British Tommies. His comrade is wounded.

An extraordinary picture of French soldiers surrendering to the enemy after being cut off from their own company in a trench assault.

When RIVERS



The size of the new San Gabriel Dam, in which 2,000 tons of concrete must be poured each day for five years in order to finish it, is best shown in comparison with superposed picture of four or five blocks from an average city street.

TWENTY-FIVE million dollars is a large sum to spend for protection from floods, but that is what Los Angeles county, in southern California, is spending to insure Los Angeles city and county against inundation such as that which occurred in 1914, when upwards of $20,000,000 damage was done by waters overflowing the banks of streams.

This flood insurance money is being spent to build San Gabriel dam—largest in the world—more than a city block wide at the base, higher than some of the Pyramids of Egypt, and nearly half a mile across the top. The project is just getting under way, and will be seven years in the making, with 2,000 men at work.

It is 31 miles northeast of Los Angeles, eleven miles north of Azusa, twelve miles due east of Mt. Wilson, and at the Forks of the San Gabriel river. In 1924 Los Angeles county voted bonds amounting to $25,000,000 for the construction of this colossal pile of reinforced concrete by the Los Angeles County Flood Control District.

It was necessary to obtain permits from federal as well as state and county officials. Secretary of Agriculture Jardine had authority over lands over which materials have to be transported, because the dam site is in Angeles Forest Reserve. Secretary of Interior Work had authority over the proposed location for a dam. The Federal Power Commission had to be consulted for permission to control waters which might have to do with power development. The California State Engineer had to pass on the feasibility and safety of the project.

Beginning in 1924 the project was kicked and cuffed all over the country, being subjected to all sorts of political and commercial controversies. Many hearings were held at the national capital, and at one time the Superior Court in Los Angeles moved up to the dam site to consider an injunction suit. When the Board of Supervisors met, a few weeks ago, to award the contract, protests against awarding it were filed by three cities, two organizations and twenty-five individuals.

Scores of miners, who sought gold in the canyon, filed placer claims, and threatened to enjoin the county if it backed water up on their holdings. The federal government

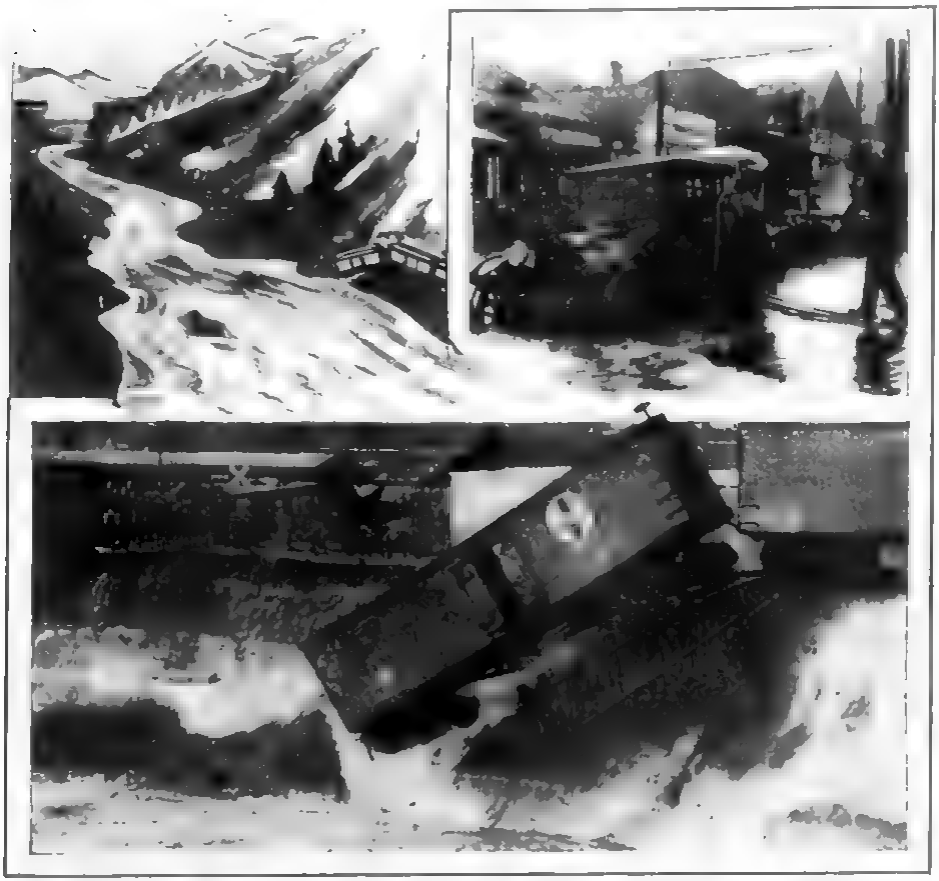
Run Wild

by Howard Kegley

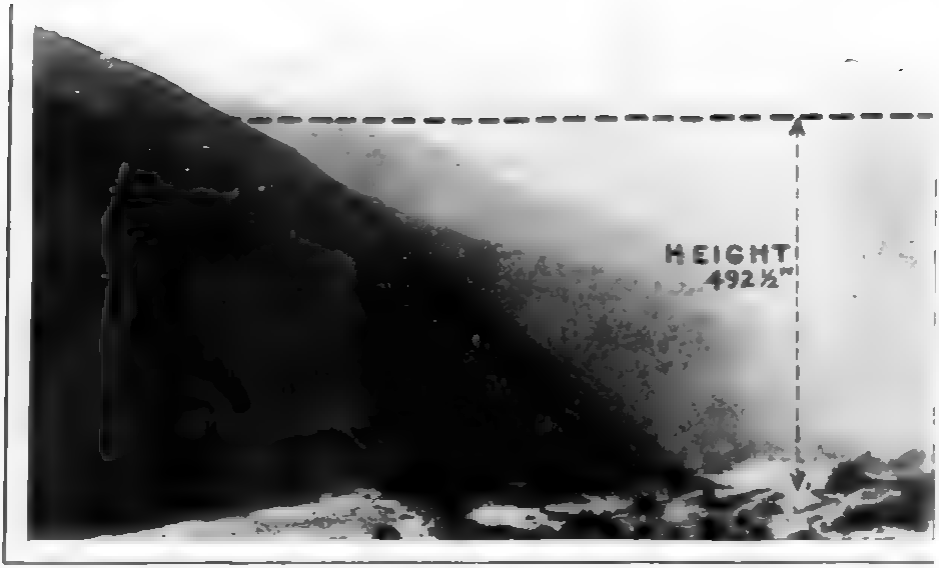
California, subject to periodic rainfall and melting of snows in the mountains, has been victimized by rampant rivers in the score of months just past. Told here, the story of the San Gabriel Dam shows the gigantic size of this water impounding monster, and how two rivers will be controlled with one dam.

sent engineers to investigate the placers and their probable value. The county paid them off at the rate of $500 for each 20-acre claim.

The city of Pasadena laid claim to 65,000 acre feet of the run-off, filed on a dam site below the Forks, and sought to enjoin the county from passing over its site to reach the Forks. This controversy was quieted when the county agreed to impound 65,000



Floods have been one of man's enemies since the dawn of civilization. Nothing is as destructive as a river which has overflown its banks and which has run wild. Above is a street scene in the recent California flood. Below, an eroded embankment with a car caught by our photographer in the very act of falling!



To the right of this spread will be seen the first puny cut taken by the constructors. One shoulder of the dam starts there, and ends across the valley where the line above ends.

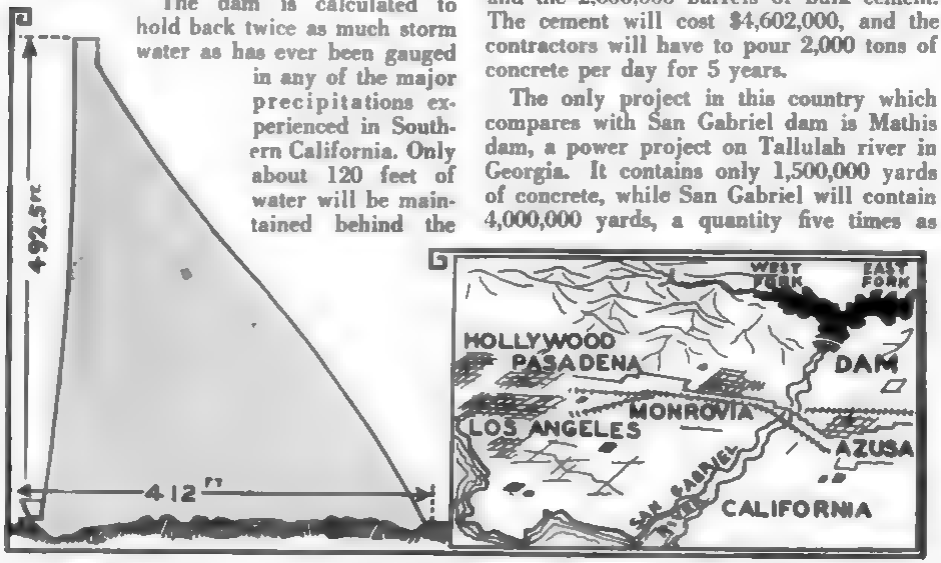
acre feet of water for Pasadena until such time as its right to it might be established or denied by the courts.

While the controversy was at its height Los Angeles county had the Forks site inspected and the dam plans reviewed by the late Gen. George Goethals.

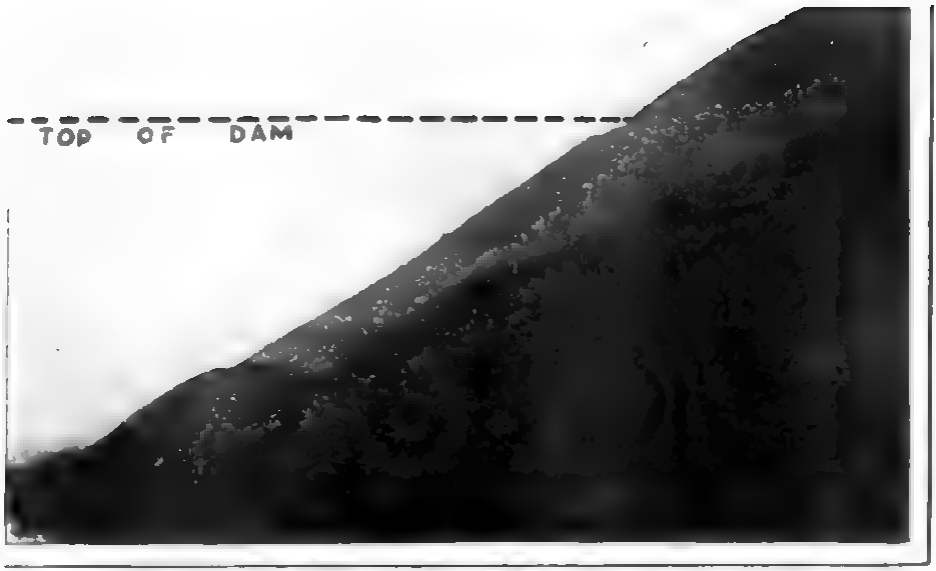
The dam is calculated to hold back twice as much storm water as has ever been gauged in any of the major precipitations experienced in Southern California. Only about 120 feet of water will be maintained behind the dam. When it rises higher, it will gradually be drawn off through the spillways.

The contractors, Claude Fisher, C. R. Ross, Alan MacDonald and Felix Kahn, are to supply the rock and gravel, and do the job for $11,250,040. Los Angeles county will furnish the 3,500,000 pounds of steel, and the 2,600,000 barrels of bulk cement. The cement will cost $4,602,000, and the contractors will have to pour 2,000 tons of concrete per day for 5 years.

The only project in this country which compares with San Gabriel dam is Mathis dam, a power project on Tallulah river in Georgia. It contains only 1,500,000 yards of concrete, while San Gabriel will contain 4,000,000 yards, a quantity five times as



Above is shown a cross-section of the big dam. The map shows how it will be located.



On the sides of this slope a camp will be built for the 1,800 men who will be required in the building of the dam. The point where the dotted line ends shows the beginning leveling of a work which will take 5 years to complete.

great as that which went into the building of the great Assouan dam in Egypt.

San Gabriel dam will be 432.5 feet above stream bed and 475 feet above bedrock. It will be 2,200 feet long at the top, with a twenty-five foot roadway there. It will be 412 feet wide at the base. When completed, the structure will back up a lake of water eight to ten miles wide and five miles long, with a thirty-mile shore line, and will store 210,000 acre feet of water.

Necessity for this dam, which is purely for flood control, grew out of the fact that at intervals of eighteen to thirty years Los Angeles county has experienced downpours which have overflowed streams and greatly damaged property.

Such floods, rushing down from the mountains, have swept silt from 50,000 acres of valley ranches into Los Angeles harbor, and have cost the federal government and city of Los Angeles millions of dollars for channel-dredging.

Below the dam site the county has built hundreds of cottages to house from six to eight laborers each, and has erected a dining-hall which can accommodate 1,800 persons at a meal. A contract for feeding the men on the job had been awarded to a catering company on the basis of $1.35 per day for each individual.

The San Gabriel reservoir, as shown above, will be twelve miles long when completed.

Build this SIMPLE

By GILBERT MICKELSON

Using a starting motor from an old car, Jim Smith and Bob White built a tiny electric launch which can travel seven miles an hour! Full explanations are given in this article.

IT WAS SPRING. The wind on the hill back of Jim Smith's home seemed to be calling Jim toward the water. The sun on the fresh blue lake in front of the house called for action, but Jim was listless. He had the same feeling which assails everyone in the spring after a hard winter of fun in the frozen out of doors.

"I guess it's spring fever," muttered Jim to himself as he sauntered down the walk toward the beach.

"Yes, and I've got a good cure for it, too," said a voice behind him. It was lanky Bob, Jim's bosom pal.

"What is it this time?" asked Jim, well knowing his pal's penchant for springing old stunts to keep from growing old.

"Look at that lake!" quoth Bob, pointing enthusiastically.

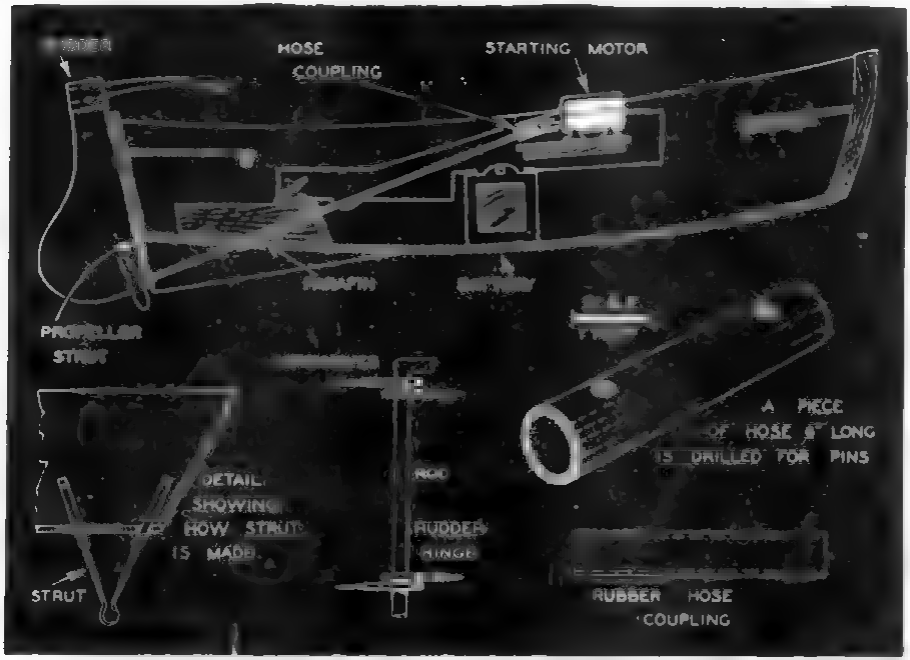
"I see it," muttered Jim, "and what of it?"

"Listen! We want to get out on the water. That's the trouble with you and me! We've been sitting around these last few weeks waiting for a balmy day so we could experiment as in days of yore! I propose we take my little boat, the *Tim*, and do some high power motorboating with her. That'd fill out our afternoon and shake some of the loafing tendencies from your frame. Here's the idea:

"You get us a starter from an old derelict flivver. If you can't find one in a vacant lot down near town, go into the nearest second hand auto parts dealer and *buy* one. Don't let him soak you more than two and a half iron men for it because it won't be worth more. Get a four foot piece of half inch iron rod from some blacksmith. He'll soak you two-bits, and the rod will be rough, but watch me make a propeller shaft out of it for this tremendous electric driven battleship I am telling you about."

Jim shook his apathy. "I see. A starter motor makes a good source of power. So I do the running and get the stuff, you sit here and drink in the sunshine, and when I get the leg work done you'll sit

ELECTRIC *Launch*



The method of installing the shaft log, which is the most important alteration in the conversion, to the boat is shown in this blueprint. Note the rubber hose coupling which serves as a universal joint. The brace for the propeller, or shaft hanger, is made of strap iron.

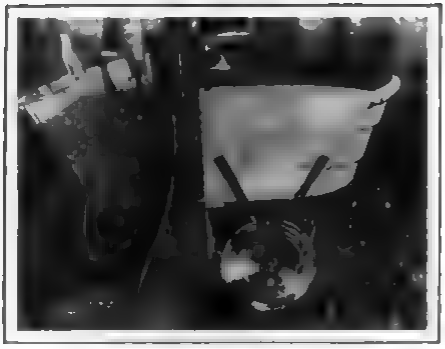
around and boss me on the installation of the turbo electric conversion. All right, I'm game!" And Jim was off to town, for on anything he grew enthusiastic about he was tireless.

Meanwhile Bob, who seldom gave birth to ideas of marked originality, busied himself in glee with the trouble of getting the little *Tim* out from under the porch, cleaning the leaves from her and removing the rear seat in preparation to putting in the log through which the propeller shaft was to be put.

Setting the boat on two sawhorses, he carefully planned the line of drive for the motor shaft. Taking a propeller from an old Evinrude outboard motor and measuring the diameter, he reasoned that since the propeller was ten inches in diameter he would have to allow a circle of about twelve inches diameter for the propeller to swing in. Half of that would be six inches. So placing a thin board against the back end of the boat the measurements shown in the diagram in figure 1 were taken. Bob placed the outside center for the propeller as being six inches from the keel and six inches down from the bottom of the hull.

Subconsciously he decided on installing the motor to one side, little knowing that fishermen on the Maine coast have for years been converting old sail boats to power boats by placing the motor off to one side of the keel and running the propeller shaft

DETAIL SHOWING HOW SHAFTLOG IS MADE OF 2"X 4" AND HOW HOLE IS SAWED AND CHISELED IN. INSIDE BEARING IS HARD OAK



Give her the gun! Jim is trying out the installation with a throw of the switch and the little propeller, taken from an outboard motor, is whirring around in great shape. Note that motor is placed off center of boat.

out almost any place it was convenient. Wittingly or not, Bob had standard conversion practice up his sleeve when he made the choice. Motor weighing so much, off to one side, he reasoned; battery weighing so much more off to the other so as to make the little "ship" trim.

Since the *Tim* was planked crosswise on the bottom like most inexpensive boats are, Bob decided that the hole for the shaft must be placed where it would spoil only one plank. By holding his square as shown he ascertained the angle which the shaft would have on the inside of the boat.

Boring through the bottom plank was a simple trick, and transferring the angle for the shaft to the shaft log was another simple trick. Bob thought it best in the case of the shaft log to place two two by fours face to face, with the hole sides sawed and the wood chiseled out. It would save inaccurate boring. Then the two could be screwed together, a third piece screwed on top, and the whole shaft log screwed in place by sighting along the stick on the back end of the boat up into the hole in the boat until the hole in the log came into line. Then two inch brass screws would hold it down nicely.

Bob had the shaft log in and was just carrying out his battery from the radio set when Jim showed up with a beaming face. The voyager dropped his purchase into the boat.

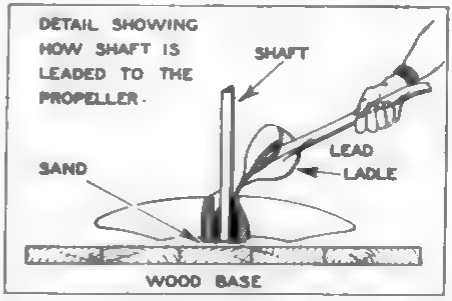
"I got a dandy motor for two bucks," he enjoined the other. "I made the shopkeeper run the thing so I know it runs right. It turns right, clockwise, too, so it will fit the propeller. You have to have the motor turn the same way the propeller is designed to turn or the boat will go backwards!"

"You mean you have to have a propeller which turns the way the starting motor turns," laughed Bob. "All starting motors turn clockwise."

"Well they have to fit, anyway," replied Jimmie. "And I got a couple of yards of number fourteen copper wire so that the current will have some place to go, and I got a twenty-five cent single throw knife switch so that the current will have some place to go *from*. Say, Bob, how are you going to keep that shaft log tight? And what are you going to use for a stuffing box?"

"Shhh! Don't look so iggerant," mysteriously replied the instigator of the floating electrical palace. "Look here!"

But Jim was never slow to comprehend. As a matter of fact it was generally Jim who engineered the escapades of the two cronies. Whenever a difficult technical problem concerned them during their adventures in things mechanical it was Jim who always had the information right at hand. Accordingly he grasped the intent of



The method evolved for fixing the propeller to the shaft is shown above. The hole in the propeller hub is bushed with melted babbitt.

his chum's actions and helped to bend a strap iron strut into shape out of ¾ by ⅛ inch strap iron.

"Use the shaft as a mandrel in the vise and bend the strap around it first, then bend in the other steps," said Jim as he sketched the processes to Bob. "No need for using lead or bearing metal in this strut because the water will lubricate it. All we have to do is to make a fit snug enough to keep the shaft from wobbling.

Three countersunk screw holes will hold it to the back end of the boat nicely."

Since the shaft was long enough to enable the propeller to be put on and still run to the motor when the latter was residing upon the seat in the middle of the boat, it was Jim's suggestion that they merely clamp the motor to the seat of the boat, placing a wood angle block under the motor so as to bring the differences in angles down to less, and then drill holes in each shaft, slip on a piece of rubber hose, put nails through the holes, and then they would have a flexible and perfect universal joint.

"They use it in all cars to drive generators," prompted Jim, and Bob was won over.

"How shall we fasten the propeller?" asked Bob. Jim in his usual way had taken command of the affair and was issuing orders here and there for the execution of his ideas.

"Easy. All we have to do is to place

This photo gives a good idea of the stern of Tim. The shaft hanger and the rudder are very well shown. Note the propeller is offside to permit the rudder to swing.

the propeller on a board on which some wet sand has been placed. Laying it face down we will put the somewhat flattened end of the propeller in it, center it up and down by eye, and while one of us holds it gently at the other end so as to let gravity center it in the propeller hole like a plumb bob, we'll have one of us pour hot lead into the hole. That will seal it into the propeller tightly. If we want to get it out a blow torch will take it out for us in sixty seconds. If we don't get it centered the motor won't turn it fast enough to cause us any vibration. Simple, simple!"

This shows the motor, installed on a seat as an engine bed, "doing its stuff" while driving Tim. The shot was made from the stern seat.

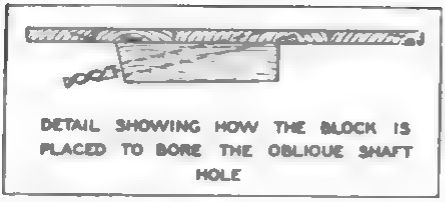
The propeller was mounted upon the propeller shaft in just that way. Jim held the shaft while Bob poured the lead, melted in an iron ladle over a blow torch. Suddenly another problem presented itself.

A block of oak was bored out to half inch strong measurement, and faced to square with the end of the shaft log as shown in the diagram. Further, a hole was drilled, ½-in. in diameter, just above the shaft in the log so that paraffin could be poured into the log to make it tight.

"Simplest thing in the world," exclaimed Bob. "You'll have to put the shaft completely in, then plaster around the outside with the wax so that a little when first poured will hold and won't leak out over the floor."

This was done. The paraffin, which comes in 12 cent blocks at the corner store, was broken into lumps about the size of sugar cubes and melted slowly by a blow-torch in the same ladle in which they had poured the lead for the propeller. Bob dipped a big spoonful out and when it was almost crystallized he kneaded it so that by jamming into the crevices around the bottom of the boat where the shaft came out, Jim was enabled to pour just a little paraffin, fairly cool, down the shaft log to seal the bottom end. He was careful not to run the shaft, as that would have broken the seal and the hot wax would have run out onto the ground.

"The next ladle will have to be smoking hot so as to penetrate all parts of the wood and seal the seams under the log," remarked Jim. And it was! When the little



DETAIL SHOWING HOW THE BLOCK IS PLACED TO BORE THE OBLIQUE SHAFT HOLE

hole on the top of the log was full of bubbling paraffin the two stopped pouring, waiting until the cooling of the wax would cause the level to lower, when they would pour more in until they had a completed, neat job.

The battery was placed in, off to one side as Bob suggested, so as to balance the weight. By this time the wax had cooled enough so that Jim suggested twisting the propeller, breaking loose the wheel. Then he reached into the *Tim*, made contact with the switch and the propeller started around with a "Brrr."

"Looks like it ought to drive her about three miles an hour," said Jim, laconically.

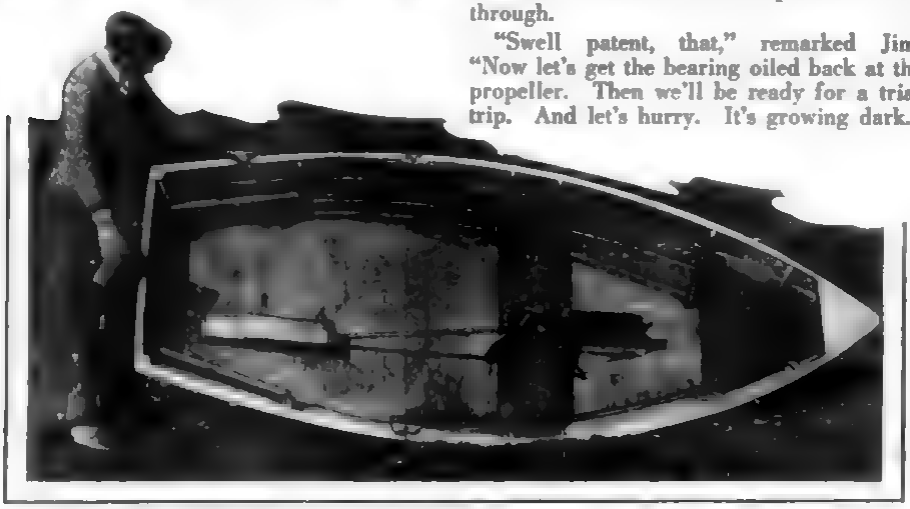
"Better than that," answered the other, "Don't you think she'll do four?"

"I dunno. Whatever she does she'll be going plenty fast for her length!" And Jim was right. Three to four miles an hour is about as fast as a man can row comfortably and without exerting himself. Had they known that if two batteries were hooked up in multiple so as to double the ampere hour output without increasing the voltage, the running life of the battery would have been increased from about two hours to about seven, and had they known that if the motor was installed on a straight line drive, that is, lined up and used without a big bend in the universal joint, that the percentage of power lost in friction would have been less and the motor would have given the boat more speed and would have run for longer periods between charging. This the two found out later, as well as the fact that if the tips of the propeller had been cut off to allow the motor to turn the smaller diameter propeller a little faster, the motor would have developed more power, would have driven the boat faster.

"Well, we'll have to have a rudder," discovered Bob. He was off to the tool shop in a minute, and came back twenty minutes later with the completed rudder just as Jim was putting the finishing touches on scraping the paraffin off. His device for hanging the rudder was little short of ingenious. For holding that worthy device of navigation in place he had fastened heavy brass screw eyes at intervals along the edge of the rudder blade, and he proceeded to do the same along the back board of the boat.

When all the screw eyes were in line he shipped a piece of eight-inch brass welding rod down through, and bent a hook in the end so that it would not slip all the way through.

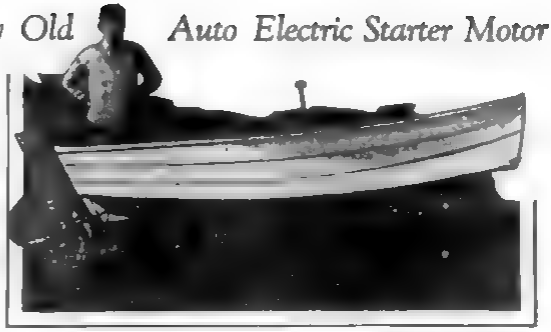
"Swell patent, that," remarked Jim. "Now let's get the bearing oiled back at the propeller. Then we'll be ready for a trial trip. And let's hurry. It's growing dark."



The general arrangement of the clamp, themtor, the shafting and the shaft is shown in this very clear view. Some of the constructional features of the boat are also shown, as for instance, the center board box forward of the seat, and the hole through which to step the mast in the bow. The motor is offside enough to allow the rudder plenty of swing.

This Launch is Powered by Old Auto Electric Starter Motor

Ingenious youths are always unearthing some very unusual stunts in the making of things for fun. Mr. Mickelson tells in this fictionized form of how-to-build story just how Jim Smith and Bob White converted an old sailing dinghy into a fine little electric launch. Any boy who has a light boat can do the same feat as the two cronies in Mr. Mickelson's fine little yarn. Let us hear from you if you like things like this in this magazine!



The necessary duties performed by way of oiling the motor, or "turbine" as Jim had come to call the old flivver starter, the boat was carried to the water.

"We'll have to put her on a trailer so that the wheel won't catch in the sand and be jimmed up." Jim's foresight saw that was necessary.

Gently they put the *Tim* into the water. Saucily she rested on the quiet surface of the lake in the late spring afternoon. She seemed proud of the fact that she was the smallest electric launch on earth, and stood as all boats seem to, ready for the trial trip, alive and expectant.

Jim stood ashore with the camera.

"You get in the back seat and give her the juice, Bob. I want to get some shots of her under steam."

Proudly Bob seated himself at the coxswain's post, took command of the rudder with one hand, and expectantly threw in the switch.

The motor came to life! There was a gurgle and a blurble at the back of the boat as the *Tim* momentarily squatted into the wake bored out by the propeller, and then in quiet, stately grace she proceeded on a fast ghost walk. Jim termed it that. It was at the same speed a man could row, but without any of the fuss attending the dipping of oars, nor the noise.

"She handles like a dream," ejaculated Bob as he headed for the dock again. "Look!" And he swung the *Tim* in her own length with the rudder.

"Say, Bob, that was the cleverest idea you ever had," exploded Jim in high enthusiasm. "She's a dandy. But after all, it's the fun of making it and trying it out to see it work that is the *big* fun, isn't it?"

"Yessir! That's true on everything we ever built," said he. And both builders nodded their heads in satisfaction. They knew that was the truth.

WIN YOUR Wings!

WOULD you like to take a complete course in flying as a gift of Modern Mechanics? Of course you would! In the June issue complete details will be announced of our big aviation contest in which a flying course and scores of other prizes will be awarded the lucky contestants! See the June issue for full information—on all news stands May First.

Barriguda Wood is Four Times as Light as Cork

A CANE made of barriguda wood, so light in weight that a one cent stamp will carry it anywhere in the United States as first class mail, has recently been added to the curios on display at the National Museum at Washington. The barriguda tree is a native of Brazil. It weighs less than 5 pounds a cubic foot, yet it is strong and much used by natives for building boats. Barriguda wood weighs only half as much as the famous balsa wood much employed in making model airplanes, and balsa wood is in turn only half as heavy as cork. As yet barriguda wood is not employed for commercial purposes, due to its scarcity, and the difficulty of lumbering in the jungles.

WATCHING SPORTS THRU A PERISCOPE

PERISCOPES for seeing over the heads of crowds are coming into popularity for use at football games and similar gatherings. These individual periscopes consist of a small rectangular box about 30 inches long and 3½ inches wide, weighing only a few ounces and being carried easily by a small strap at one end. They come in leather finishes tinted in bright colors to suit the fancy of the purchaser.

GASOLINE TRAINS COMPETE WITH STEAM

IN AT least two sections of the country gasoline powered trains are giving their steam-driven brothers a run for their money. The photo below shows two complete gasoline trains, one in Oregon and the other in Iowa. The larger train is operated between Tabor and Malvern, Iowa, a distance of eleven miles. The duties of owner, general manager, agent, conductor, and engineer are embodied in one man, E. V. Stopper of Tabor, Iowa. A Ford motor is used to drive the "locomotive."

The smaller train consists of an old Ford sedan, refitted as a passenger car, with freight and baggage hauled in an old push car on which a box body has been built. This train is locally known as the Dalles-Dufer Limited, traveling between these two towns in Oregon.

Above are shown two trains driven by Ford motors, serving sections where steam trains would be unprofitable.

Tree Transplanting Board Does Work of Four Men

A SIMPLE planting board which increases the efficiency of forest rangers fourfold in the planting of seedling trees is now in use by Uncle Sam's men. The planting board consists essentially of a pine slab in which notches are cut at the desired planting distance. These grooves are just large enough to accommodate the nursery seedlings. When the board is threaded with seedlings it is placed over a trench and the earth is filled in around the roots.

In the oval above one of Uncle Sam's forest rangers is shown threading seedling trees into the planting board used in reforestation work. There are 36 notches in the board, permitting three dozen trees to be transplanted at one time. At the left a workman shows how the board is used to hold the young trees.

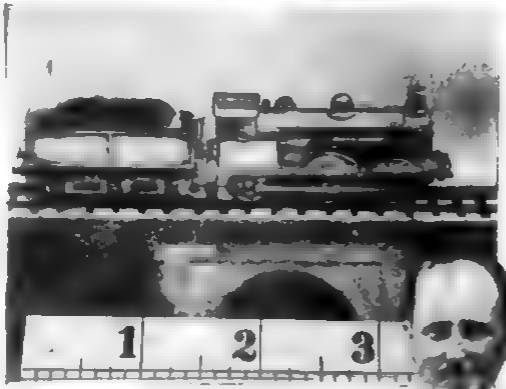
TALKING PIG IS FARMER'S TEACHER

OFFICIALS of the Department of Agriculture have invented a talking pig which is sent around the country to various agricultural fairs, where it gives lessons to pork producers on subjects having to do with successful hog raising. When the pig espies a possible listener approaching, he holds forth in this fashion: "If you're a farmer, don't let round worms come near me." Thereupon follows a pointed lecture on the various dangers which attack hogs and prevent little piggies from growing up into big piggies.

It was to combat the menace of the round worm, which infects the hog's intestines and frequently causes death, that the Department devised the talking pig. As shown in the photograph, a cutaway statuette of the hog is made, showing the various parts of the body attacked by the worms, and a phonographic attachment is inserted which starts talking when a button is pressed. Models of various sizes are made in the workshops of the Department.

Steamed Up and ready to go!

Steam Engine Master Model-Makers run



Above, W. T. Day of London, England, is shown at the throttle of a model locomotive he has made which is valued at $1,000. It is a perfect reproduction of one of the famous Stirling single-wheelers of the Great Northern Railway, which were noted for their fast running. The model is built to a scale of 1½ inches to the foot. Mr. Day's engine develops power enough within its small boiler to haul not only its maker, but a dozen other full grown persons as well. At the left is what is said to be the world's smallest working locomotive. An electric engine in the tender provides motive power, but in all other respects the model is an accurate copy of a freight engine of the London Midland Scottish Railway. It is the work of A. R. Walkley.

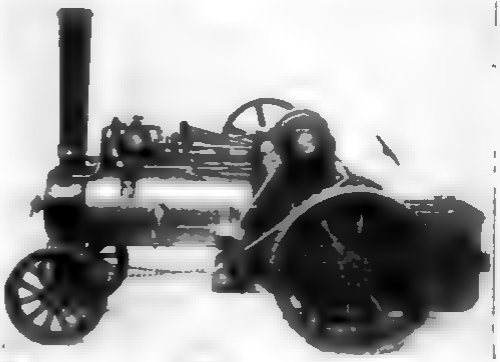
John N. Swartzell, shown at the right, is the directing genius of several complete railroad systems, all of them in his own basement! He is a resident of Washington, D. C. The photo shows him with four of his model locomotives, all of them accurate reproductions of famous engines. He employs aluminum castings for the body and boiler, with brass for the wheels and trucks. Mr. Swartzell has 500 feet of rail in his basement on which his miniature trains maintain regular schedules.

Scale Models are Marvels of Mechanical Precision

MODELS *that Run*

Their Own Railroads!

John Matthews of Chicago, Ill., is deservedly recognized as the maker of some of the finest working models of steam machinery in the world. Both the locomotive and the steam tractor shown on this page are products of his workshop. Recently he took his locomotive to London and entered it in competition at the Model Engineering Exhibition, where the finest models of the world compete for prizes each year. His engine carried off the medal in open competition, and he was awarded a silver cup for the fine running of his locomotive on the track. On one trip the engine hauled 17 people, although it is only 5 feet long, including its tender. The locomotive is a powerful model, fitted with a Walschaert valve gear, fired with coal, and working at 130 pounds steam pressure. Steam is raised in ten minutes. It took two years to build this model.



Mr. Matthews' miniature steam tractor hauls a load of passengers with ease. It is shown hauling a load of approximately 500 lbs., through a Chicago street.

Mechanical Skill Essential to the Model Maker

Flying DAREDEVILS

By HI SIBLEY

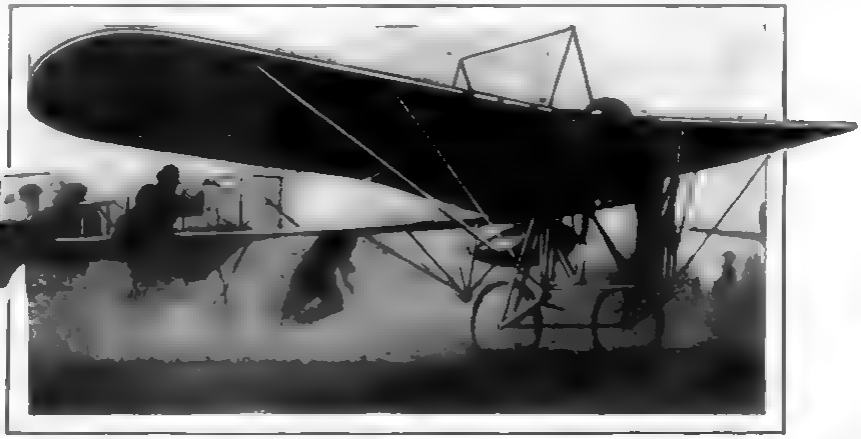
America's first Aviation Meet was held in Los Angeles in 1910, with all the aerial daredevils of the time among those present. In this absorbing article, Mr. Sibley points out interesting contrasts between air heroes of today and yesterday.

IT HAS been said, with a good deal of truth, that the days of the flying daredevil are gone forever. True, pilots still put their machines through impossible maneuvers and extricate themselves from risky situations, but the airplanes they use are so dependable and sturdy that the public no longer looks upon these stunts as involving any element of personal danger. Contrast this with the respect accorded anybody 20 years ago who even ventured to make an ascent in a balloon or an airplane. He was regarded as a daredevil of the first water—and so he was! Study the photographs accompanying this article and see if you don't agree that only an individual of rare courage would take these planes off the ground.

In January, 1910, the first American Aviation meet was held at Los Angeles, at which all the daredevil pilots of the age were present—Louis Paulhan, Glenn Curtiss, Lincoln Beachey, and the rest of them. The stunts they put their planes through caused the admiring spectators to shout themselves hoarse and get cricks in their necks from watching airplanes climb to the incredible height of 4,000 feet!

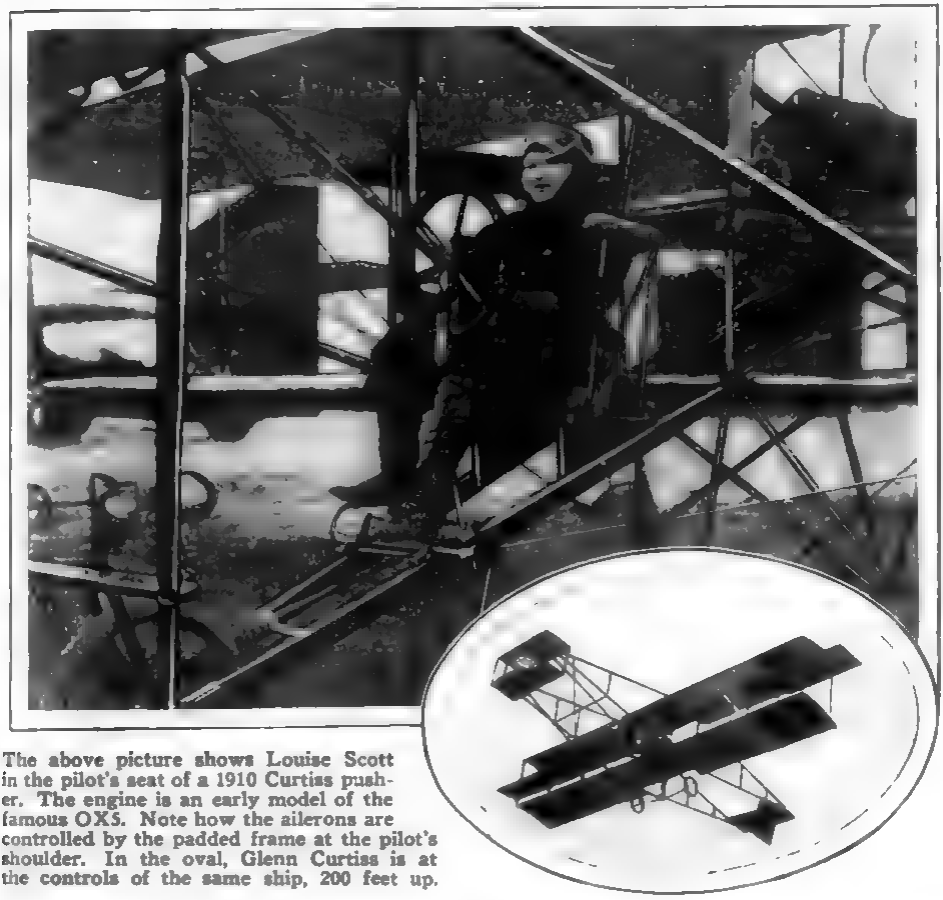
Parked around the field were as many horse-drawn vehicles as automobiles, the latter still being luxuries of the well-to-do. No one had ever heard the expression "air conscious" but every spectator at that pioneer meet was "air enthusiastic"—and how!

For ten days the American and visiting French pilots put their frail craft of bamboo and fabric through contests for sustained flight, distance, altitude and speed, and there was one event to determine the slowest that a plane could travel and remain aloft. None of the demonstrations would attract even passing notice today, but the dashing Louis Paulhan and Glenn Curtiss won the frenzied applause of the crowd.



This Bleriot monoplane of 1910 is of the same type as the one in which Louis Bleriot, its designer, made his startling flight across the English channel, hailed as the greatest feat of his day. Note how closely it resembles present day monoplanes in its fundamental design—tapered fuselage, two-wheeled landing gear, and tractor propeller. Ailerons were not used, the Wright wing-warping device being substituted.

of 20 YEARS AGO



The above picture shows Louise Scott in the pilot's seat of a 1910 Curtiss pusher. The engine is an early model of the famous OX5. Note how the ailerons are controlled by the padded frame at the pilot's shoulder. In the oval, Glenn Curtiss is at the controls of the same ship, 200 feet up.

A comparison of those first achievements with the records of today shows the amazing progress made in less than two decades, and we have hardly begun! In fact, one hesitates to set down today's high marks because long before this article can possibly get into print, new records may have been made far surpassing the present figures.

The highest speed attained at that first meet was 55 miles an hour. This was by Curtiss, for a short spurt only, and he carried one passenger. Alongside today's record of 318.57 m. p. h., this seems sluggish indeed. Paulhan's altitude record was 4.165 feet as against 38,474 feet—seven and a half miles! In sustained flight Paulhan soared around above the field for slightly less than two hours, covering 75.77 miles, being forced down by a gasoline leak. Delprete and Pinedo remained in the air 58 hours, 34 minutes, and the former with Ferrarin made 4.417 miles in a single hop from Italy to Brazil. Sixty-six feet per minute—not per second—was then a record for climbing, made by C. K. Hamilton in a Curtiss biplane.

The greatest sensation of the meet was Paulhan's cross country flight of 45¼ miles, reported by Prof. H. La V. Twining in *Aeronautics* Magazine:

This is the scene of America's first Aviation Meet, held in Los Angeles in 1910. Circus tents were used to house the flying machines. This composite photo, taken at the time, shows a dirigible, a balloon, a Farman, a Bleriot, and a Curtiss plane performing for the spectators.

". . . the greatest event of the week, arousing enthusiasm admixed with awe that eclipsed that of the day of his high flight. It was wonderful to see him gradually growing smaller and smaller and finally disappear against the white of snow on the background of mountains. His return was equally awesome from the time he was a tiny dot, high in the air above the mountains, till the moment of his landing. His greatest height was 1,968 feet; elapsed time 1 hr., 2 min. 42⅕ sec. Engine behaved well. Paulhan viewed the country as he flew, using field glasses."

It was characteristic of the period that altitude was referred to as "height" and sustained flight as "endurance contest." The term "ceiling" had not yet been adopted in flying circles.

One of the first experiments in dropping bombs was made by an officer of the U. S. Signal Corps flying with Paulhan at an altitude of 250 feet. The target was a 20-foot square marked out on the ground, but the nearest hit was 66 feet outside the line, owing to the officer's miscalculation of the plane's speed. Roy Knabenshue had better success in dropping the dummy bombs from a dirigible, but his speed was only about 16 m. p. h., and altitude 60 feet. "The lesson gained at this low altitude," observed an astute reporter, "is problematical."

The dirigibles were indeed in a primitive stage, consisting of a small cigar-shaped balloon about 60 feet long by 18 feet in diameter, with a light triangular-section frame work suspended beneath to carry motor and pilot. The engine was a tiny two-cylinder motorcycle type, and the pilot was obliged to scamper back and forth on the skeleton framework to maneuver the nose up or down. In a "hotly contested race," of one lap around the 1.61 mile course Lincoln Beachey won from Knabenshue at slightly over 19 m. p. h.

At the time of the Aviation Meet, and for five years thereafter, Lincoln Beachey was undoubtedly the premier acrobatic flyer of the world. Only a year after his victory in the dirigible race, Beachey flew an airplane over Niagara Falls, under the suspension bridge connecting the United States with Canada.

He once suggested to a group of pilots, eager for some new stunt to break the ennui of straightaway flying, that they all rise to a height of 5,000 feet and nose over in a steep dive for the earth. The one who was closest to the earth before he leveled off his plane would be adjudged the winner. Nobody wanted to take up Beachey's suggestion, however. Beachey was at the height of his fame when an untimely loop over San Francisco bay, in full view of thousands of spectators of the 1915 Panama-Pacific Exposition, resulted in his death when his plane collapsed and drowned him in the waters of the bay.

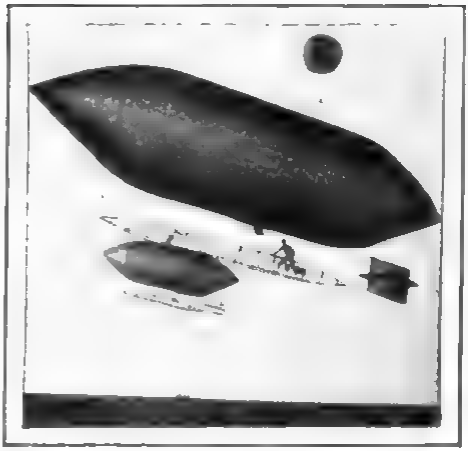
Many of the features of those planes which made the best showing are now obsolete, and singularly the trim little Bleriot, whose behavior was disappointing throughout the meet, embodied a design which in general survives in the best monoplane types of today. Both Curtiss and Farman

biplanes were pushers; the elevators were in front and the pilot and passenger sat out on the front edge of the lower wing, exposed to the elements.

The Bleriot, on the other hand—the same model which had been first to cross the English channel six months before—was very much like modern monoplanes in appearance and principle. It had the two-wheel landing gear equipped with shock-absorbers, tail skid, a tapered—though only partially covered—fuselage, and a cockpit for the pilot. The wing design, stabilizer, elevators, vertical fin and rudder were much the same as modern practice. More significant, it was a tractor with a radial, air-cooled motor in the nose.

In justice to the Bleriot it must be said that its poor showing was largely due to restrictions, through a suit by Wright brothers, on the use of its wing-warping device. Most of the other planes were equipped with ailerons of one design or another.

Years have passed swiftly since that first American air meet, bringing with them such amazing achievements as those of Lindbergh, Byrd, Chamberlin, Amundsen, Wilkins, Eckener, Kingsford-Smith and a score of others, and yet it is doubtful if any subsequent feat has ever inspired the indescribable sensation that comes with seeing, for the first time, a man and a machine high in the air.

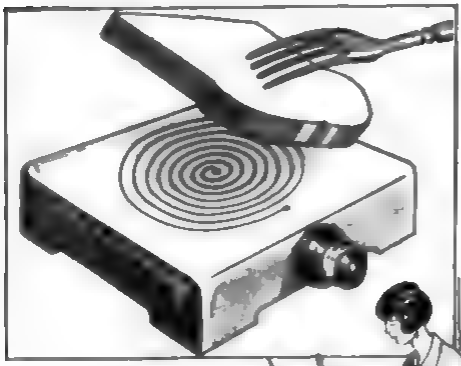


Here is a photo of the famous dirigible race, won by Lincoln Beachey at the tremendous speed of 19 m.p.h.! Beachey is the pilot of the larger dirigible. To control the movements of the bag, it was necessary to run up and down the catwalk in which the pilot can be seen.

An interesting contrast with 1910 planes is afforded by this interior view of the passengers' quarters in a new Fokker plane. Except for safety belts on the chairs, there is nothing to suggest that this luxurious scene was not taken in the owner's cabin of a yacht, or in a private car.

These Ideas May Make

Here are ideas, which if developed by the right man, should easily net him a fine business and a neat fortune. They have been selected for their originality and in the light of apparent demand for them by the editors of Modern Mechanics, who believe no development work has been done on the schemes other than the mere conception of the idea. It is believed by the editors the right man can make $1,000,000 using any of these ideas as a nucleus.



Above is shown a simple electric toaster, which should easily be made for a few cents each to retail by the thousand in stores of the 5 and 10 cent variety.

POPULAR ELECTRIC TOASTER

FRANK W. WOOLWORTH built one of the largest businesses in the world on the theory that good goods sold at a slight profit would be bought in such enormous quantities that he could turn his money more frequently each year and come out on the "long" side of the ledger. That he and all other pioneer merchants were right is attested to by the 110 Woolworth stores, not to mention the huge mail order houses which do business on the same principles through the mail.

To any one who will make electric household appliances available to everyone for a few cents, say for instance in such a product as an electric toaster, as illustrated above, rich rewards are sure to come.

The device we suggest is merely a soapstone heating element in which a spiral length of iron resistance wire is imbedded and in which connections for the usual electric plug are installed.

The uses to which such an article could be put would multiply in proportion to the ease with which the general public could purchase.

No one has as yet evolved a finder which would focus the camera at the proper distance, and give an aperture and time reading so as to prevent poor photos. See text.

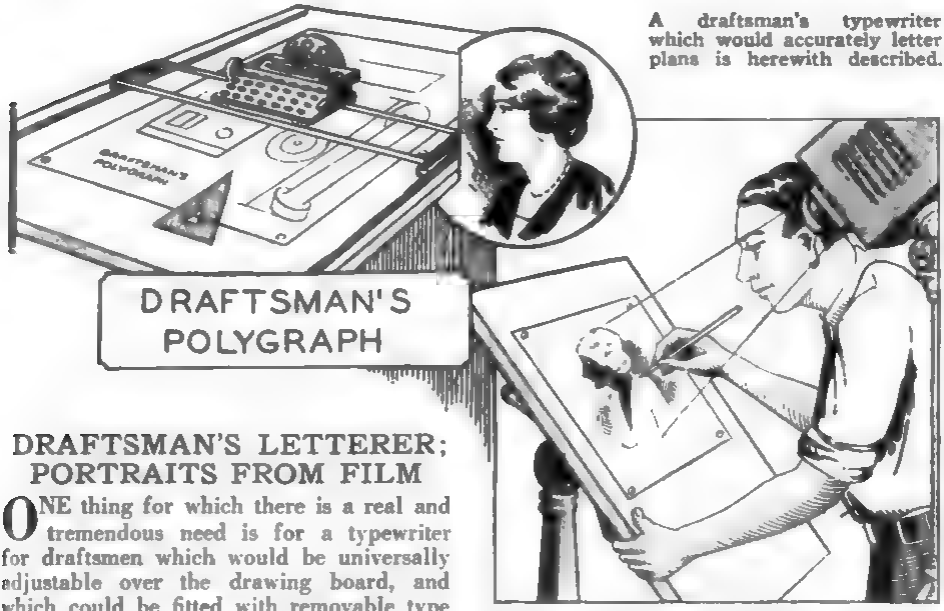
FOCUSING FINDER FOR CAMERAS

THE waste which is entailed each and every year in the use of cameras by unskilled people is enormous. Any man in the photo developing business will tell you that the percentage of negatives which turn out well are surprisingly small.

Why not a finder for the camera which would tell when the focus, the aperture and the speed for exposure are *right?*

It seems reasonable to believe that someone will evolve a *focusing* device so simple, so small and compact that every one of the millions of users of cameras will say, "I want that!"

YOU $1,000,000



A draftsman's typewriter which would accurately letter plans is herewith described.

DRAFTSMAN'S LETTERER; PORTRAITS FROM FILM

ONE thing for which there is a real and tremendous need is for a typewriter for draftsmen which would be universally adjustable over the drawing board, and which could be fitted with removable type platens carrying a variety of sizes and styles of lettering.

One prominent architect and engineer says that in drafting offices, there is a great deal of the time spent in merely lettering in by hand what should otherwise be quickly done by machine.

Our hunch is to provide the machine, similar to the one shown in the above drawing, with a movable carriage adjustable to all angles and parallels, and to ink it with printer's ink so it would blueprint well. This should be a winner!

Persons of artistic ability might easily become heavily patronized by evolving clever pencil or crayon portraits of wealthy people after the manner described in the drawing.

WOULD not the negative of a portrait or other photograph, if put into an enlarging machine and projected upon a piece of drawing paper, in a dark room, produce a hand-drawn picture if the pencil was used to fill in the projected negative so that it was an even black in all places? The resulting hand-drawn positive would have remarkable tonal quality.

Think of the fat advertising contracts which would fall into the lap of the man who invents a phosphorescent smoke for night skywriting! A more spectacular and conspicuous means of display than a sign in glowing smoke, written by plane, would be hard to imagine.

New Walking Stick Flashes Warning Lights

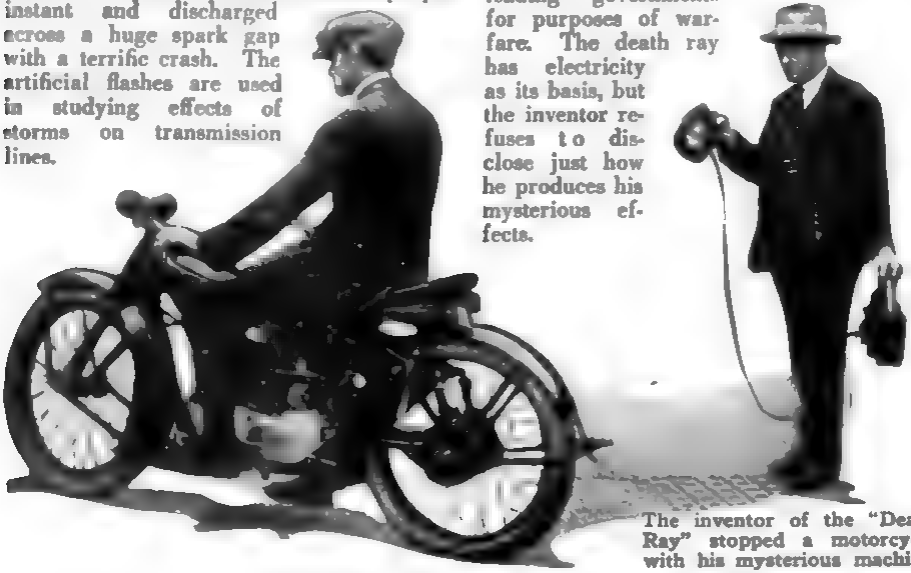
PEDESTRIANS who have been exposing themselves to serious injury from passing motor cars by walking on the highways at night without anything to indicate their presence can now equip themselves with a walking stick which has a light in the handle which flashes off and on. An electric battery inside the hollow handle of the cane supplies current to white and red lamp bulbs. The man in the picture at the left is demonstrating how the new "Walksafe" stick, as it is called, operates. The electric device is contained in the space just below his left hand; the little key projecting outward from the cane just under his fingers is the switch by which the lights are turned on.

BIG LIGHTNING VOLT PRODUCED

EXPERIMENTERS in the laboratories of the General Electric Company recently succeeded in producing an artificial lightning flash of 5,000,000 volts, the most powerful ever produced by man. The best previous record was set a year ago when a bolt of 3,400,000 volts was produced. Four 1,250,000 volt generators were hooked up in series to produce the big flash, being so arranged that the voltages of each were combined at the proper instant and discharged across a huge spark gap with a terrific crash. The artificial flashes are used in studying effects of storms on transmission lines.

DEATH RAY STOPS MOTOR

USING portable apparatus weighing less than 50 pounds, the inventor of the so-called "death ray" recently succeeded in stopping the motor of a motorcycle by directing the deadly rays into the vitals of the engine. The photo below shows him just after completing his successful demonstration. He is A. Roberts of London, England. Mr. Roberts claims to be the original inventor of the death ray which he showed to H. Grindell Matthews, who won considerable newspaper publicity through his efforts to dispose of the ray to leading governments for purposes of warfare. The death ray has electricity as its basis, but the inventor refuses to disclose just how he produces his mysterious effects.



The inventor of the "Death Ray" stopped a motorcycle with his mysterious machine.

TINY AIRPLANE FOLDS *Into* SUITCASE

On a span of but 12 feet, with only 4 (four) horsepower, this little plane develops a top speed of 60 m.p.h. It will fold into a suitcase. All parts are demountable and detachable.

DEPICTED in this month's MODERN MECHANICS' cover is the tiny bicycle type biplane which has been developed in France by M. Pischof.

The tiny biplane has a span of but 12 feet, weighs but 200 lbs., and is powered with a 4 h. p. opposed motor. This is evidently enough to give passable performance for the little ship was recently test flown by a grown man for a distance of 20 miles.

M. Pischof, a Russian, has interested French manufacturers in the unusual features of his plane, among which are: front spar of lower wing acting as axle for landing gear; complete demountability of fuselage, wings, and motor assembly, which fold into a small trunk or large suitcase; tube fuselage constructed of seamless welded tubing on which is mounted the pilot's seat (ordinary bicycle saddle with belt attachment) and demountable engine. It is said the manufacturers are going to place the plane on the market within a year, but at present no information can be obtained concerning the plans of the company, nor are plans being sold.

Several years ago France was the scene of trials for just such an airplane, also designed and built by Pischof. That plane however, was larger, though with a 20 h. p. motor the performance was excellent. This later plane, pictured above, is the outcome of several years' test work in the developing of a pint sized plane for commercial travelers and globe trotters and is reputed to be thoroughly practical. Thus France, too, is working for the advancement of the light airplane.

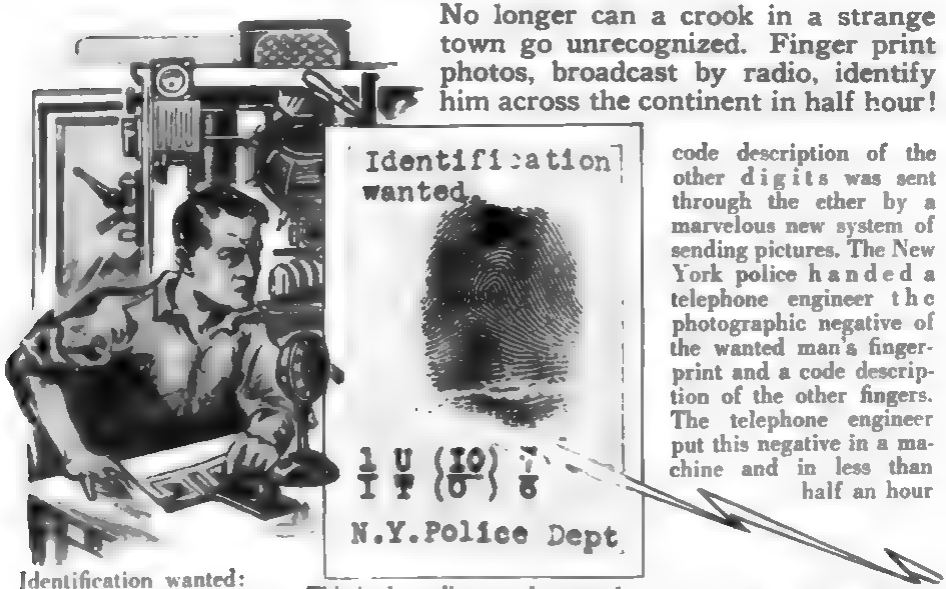
The comparative size of the Pischof biplane is shown by the two children. The trailing edge of the top wing is scarcely waist high.

The flying of light airplanes is much safer in proportion to hazards than is the flying of larger ships, given motors of equal reliability. In England, where the light plane has come into quite extensive use, tourists go hedge hopping from one town to another as a matter of course. The light plane lands slower, is more controllable, and can be set down in almost any cabbage patch and flown out again. Forced landings hold little risk for it, and consequently lower altitude flying can be indulged in, making cross country travel interesting.

Catching Crooks by Radio

By GEORGE C. HENDERSON

No longer can a crook in a strange town go unrecognized. Finger print photos, broadcast by radio, identify him across the continent in half hour!



Identification wanted:

I	U	(10)	7
I	T	(0)	6

This is the radio-cast photograph which identified a criminal across the width of the continent.

THESE cryptic signs, sent together with a fingerprint photo by the telephotographic process through 2,500 miles of space over mountains and desert in a few minutes' time, constituted a challenge from the New York police to the San Francisco police to answer one question—"Who is the man? Who is the owner of the fingerprint?"

Mr. X, the mystery crook, was a puzzle to the New York police, who suspected he was a notorious criminal. He gave a false name and address, which made them still more suspicious. The only clue was the San Francisco label on his coat. That inspired the hope that the police of the western city might have a "rap" on Mr. X.

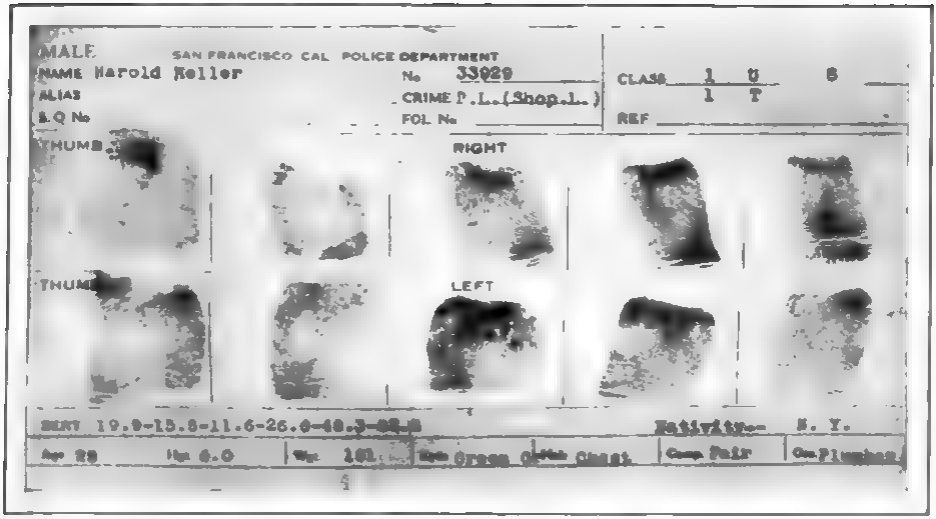
New York had to act quickly. The prisoner's lawyer would have Mr. X out of custody on a court order before a letter inclosing photo and fingerprints could be sent to San Francisco. It was decided to try the radio. So the fingerprint photo and the code description of the other digits was sent through the ether by a marvelous new system of sending pictures. The New York police handed a telephone engineer the photographic negative of the wanted man's fingerprint and a code description of the other fingers. The telephone engineer put this negative in a machine and in less than half an hour a wet, freshly developed film was handed to Chief Daniel O'Brien of San Francisco and was quickly printed. Distance had been annihilated, space conquered, time outdone. Trans-continental police radio identification had become a fact.

Holding in his hand the thousand-league photograph, the San Francisco identification expert moved along his row of cabinets until he came to one marked U-T, fished out a section marked 7 and scanned the fifty-odd cards in it. Then he looked up sharply.

"It's not here," he said, addressing the group of prominent police officials who had gathered to watch the demonstration.

And this was true. It was not in section 7 as the code indicated but a minute later was discovered in a group marked 8. The records of the two departments had varied by one point. Here was an exact duplicate of the New York print that had just arrived by radio.

The expert lifted out the card and handed it to Chief O'Brien. It contained the photograph, fingerprints, description, Bertillon



In New York the police had the fingerprint shown on page 76. In San Francisco, this card rested in the police files. By use of a new machine for sending photos by radio, the New York picture was placed in the hands of the San Francisco police and the criminal quickly identified.

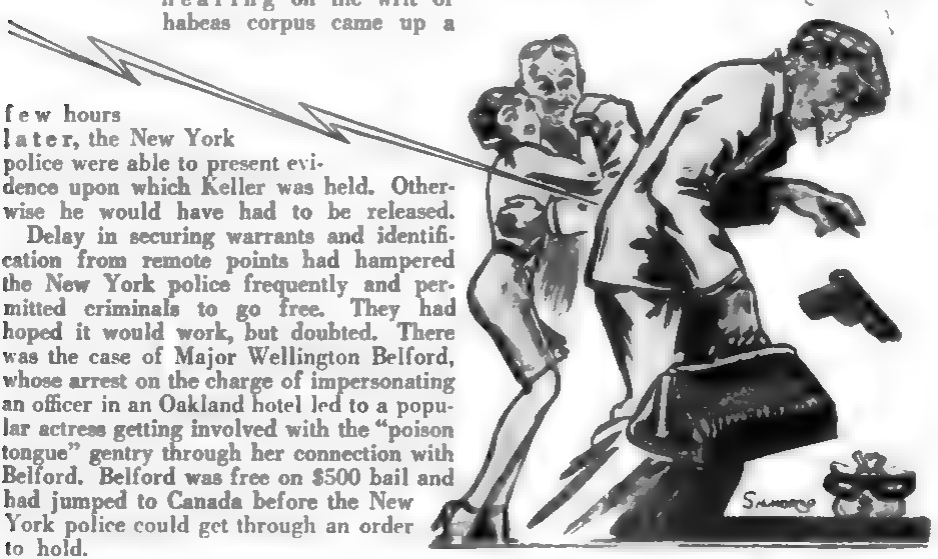
measurement and criminal record of Harold Keller, convicted shoplifter.

One hour and ten minutes after the print had been placed on the transmitting instrument in New York, the San Francisco police had completely identified the suspect and wired the Gotham police head of this identification.

When confronted with this information, the fair-haired young man, the mysterious prisoner, admitted his identity. When the hearing on the writ of habeas corpus came up a few hours later, the New York police were able to present evidence upon which Keller was held. Otherwise he would have had to be released.

Delay in securing warrants and identification from remote points had hampered the New York police frequently and permitted criminals to go free. They had hoped it would work, but doubted. There was the case of Major Wellington Belford, whose arrest on the charge of impersonating an officer in an Oakland hotel led to a popular actress getting involved with the "poison tongue" gentry through her connection with Belford. Belford was free on $500 bail and had jumped to Canada before the New York police could get through an order to hold.

Now science has made this sort of thing impossible. Wire and wireless transmission of photographs have been tested thoroughly enough even to be trusted with so delicate a task as determining the freedom of a human being. X-ray photographs of a human hand, showing a broken finger, have been forwarded by wire from New York to Chicago for a diagnosis there. A Gotham newspaper has sent an entire advertising layout by this medium to a Chicago newspaper.



New York Dairies Deliver Milk in Paper Bottles

THE OLD familiar milk bottle which greets the householder on the back stoop every morning bids fair to be replaced by a paper container which has several advantages over the glass bottle. In the first place, the new container cannot be shattered and it has no glass edges to be chipped off with consequent danger of foreign particles finding their way into the milk. Instead of a flat cap as on an ordinary bottle, which must be handled with the utmost respect if the bottle opener is not to be drenched with a geyser of milk, the paper container is opened by cutting along a dotted line with a knife. If the entire contents are not consumed immediately, the top can be folded over and the milk is preserved in sanitary condition. The paper bottles are less expensive than the glass variety, costing three-fourths of a cent each, while the cost of a glass bottle averages over one cent for each time it is used, the average life of a bottle being but four trips before it is broken.

The above photos show the new paper milk containers which are replacing glass bottles. Several New York dairies are already using the paper bottles with satisfactory results. Pint-size containers are standard, as shown in the top picture. They are fastened with a metal clamp and are opened by cutting along the top. The new containers are more economical in use, since dairies need not maintain expensive bottle cleaning equipment. Milk can be shipped in paper cartons, as shown in the center picture, the wedge-shaped packages being very economical of space. Two pint containers weigh the same as a quart bottle, as shown by the balanced scales at the right.

Helium Balloons are Novel Features of this Parade

FISH and tiger balloons filled with helium gas were features of a recent parade in New York City in which a prize of $100 was offered for each balloon recovered after it had been released in the parade. The balloons were expected to float for a week before coming to earth. Helium is the same gas which is used in the Navy's dirigible *Los Angeles*. America is practically the only producer of this valuable gas, refining it from natural wells in Texas and Oklahoma. Helium is especially valuable for aircraft use because it is an inert gas and will not ignite.

BUILDING IS MODELED AS BIRTHDAY CAKE

SUGAR and flour were used in building up the birthday cake model of the Foshay building pictured in the photo at the right. The Foshay tower, built in the city of Minneapolis, was recently described in the pages of MODERN MECHANICS. The birthday cake held the center of the table at a dinner given in San Francisco to celebrate the opening of the W. B. Foshay building in that city.

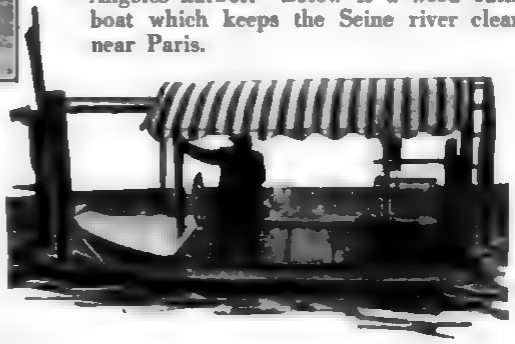
This sugar model is a birthday cake replica of the new Foshay Tower Bldg., Minneapolis.

FOSSILS SHOW EARTH'S HISTORY

FOSSIL beds uncovered by scientists in a wild, uninhabited region of New Mexico have yielded specimens representing every geologic age, from 75,000,000 years ago down to the comparative yesterday of 7,000,000 B. C. A section of the continental divide, which had been pushed up from under the earth, exposed ancient strata which contained the fossils.

Marine "Lawn Mowers" Keep Lakes Free of Weeds

TWO different types of marine "lawn mowers" are now keeping navigable waters clear of weeds in such widely separated parts of the world as Los Angeles and Paris. At the left is pictured a machine with a large washboard-like series of blades which travel on an endless chain and scrape kelp from the bottom of Los Angeles harbor. Below is a weed cutting boat which keeps the Seine river cleared near Paris.



NAVY AIRPLANES IN SHAM BATTLE

THE Navy aircraft carriers *Lexington* and *Saratoga* played a leading part in recent maneuvers at Balboa when the Black and Blue fleets, one in the Atlantic and the other in the Pacific, waged a sham battle with the Panama Canal as an objective. Ninety Boeing fighters and 74 Vought Corsairs, all powered with Wasp motors, took part in the battle, as well as 36 Martin torpedo-bombing planes.

The method of handling fuel aboard the airplane carriers is novel. Each ship carried 140,000 gallons of high test aviation gasoline when they left San Pedro. This gas is kept in tanks which are always full—when gasoline is removed, salt water is added, and the gasoline, being of lighter specific gravity, rides on top of the water. Since the tanks are always kept full, the gas and water have no chance to mix.

$20,000 MOTOR CRUISER

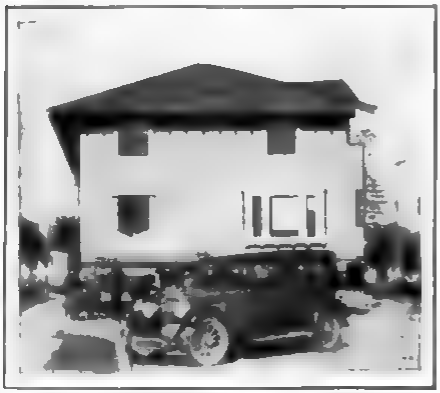
A MOTOR cruiser de luxe, constructed at a cost of $20,000 and possessing a passenger carrying capacity of 16 persons in addition to a separate compartment for chauffeur, butler, and maid, is shown in the photo below. It was built by a California man for the use of himself and his guests. Two radios with loud speakers, a refrigerator, an electric stove and lavatory are a few of the accessories in the interior of the car, which is upholstered luxuriously throughout.

Huge Pipes Carry Water Power Through Mountain

SCOTCH engineers are boring a 15-mile tunnel through a mountain to carry water power from a mountain lake to a new aluminum factory recently built by a British company. The tunnel will be 15 feet in diameter. When the water reaches the end of the tunnel it will enter three pipes, each six feet in diameter, leading down the hillside at a steep angle. The power generated by this falling water will be turned into electric current. The photo at the right shows two of the three pipes in place, and gives a good idea of the slope down which the imprisoned water will rush.

NOBODY CLAIMS HOUSE IN MIDDLE OF STREET

CITY fathers of Santa Monica, California, were confronted with a perplexing problem recently when they woke up one morning to find that a full-sized residence had sprouted up overnight in the middle of one of its main streets, blocking traffic and causing much consternation on the part of neighbors. Upon investigation, it developed that a house mover had transported the building to a vacant lot under contract with the owner, only to discover that the lot didn't belong to the house owner at all. The real owner of the lot protested to such good effect that the police set a special guard over the house to prevent its being moved onto the lot on the sly. Frantic officials were unable to discover any law forbidding the parking of houses in the street, but eventually hit upon the plan of tagging the building for obstructing traffic, and the owners were forced to appear in traffic court.



X-RAY SAVES MILLIONS FOR INDUSTRY

THE X-RAY, which began as a laboratory curiosity and developed within a short space of time into an indispensable aid to the surgeon, is now taking its place in industry as a "watchdog of the treasury." Such everyday tasks as inspecting the contents of boxes without destroying the package are daily proving the value of the X-ray in commercial use.

Government inspectors on the lookout for smugglers use the X-ray to advantage in looking through bales of cotton and other articles for contraband goods. Pearl hunters are now able to discover the gems without opening the oyster, thanks to the X-ray. Moreover, the X-ray distinguishes between an imitation pearl and a genuine one, since the imitation emits less light under the X-ray and is easily identified as spurious. Chocolate manufacturers have used the ray in inspecting their product for possible extraneous content. The X-ray also has helped the golfer in improving his game through disclosing how to prevent crushing the core of the ball out of shape during manufacture.

LUMBERING

Tractors replace horses in the big lumbering camps.

The modern method of handling big logs in the lumbering camps is graphically shown by the above photo, in which three huge logs are being dragged to the mill by a tractor and a "high wheeler." Another view of a "high wheeler" of less sturdy dimensions is shown at the left. Logs are easily suspended under the high axles of the wheels and dragged through the woods by a tractor which does the work of a dozen horses.

When a high-wheeler and tractor get busy dragging a load of logs, the combination produces considerable dust, as shown above. There aren't any street water wagons in the big woods!

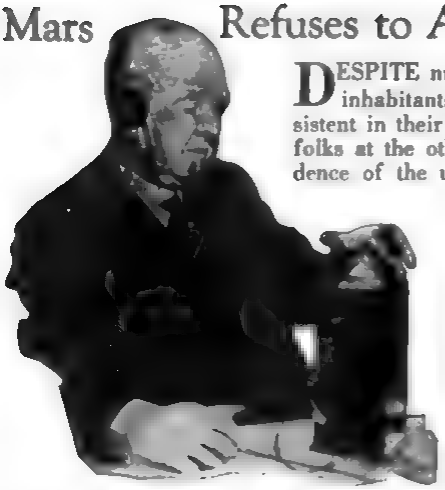
by MACHINE

This giant cypress log came from the timber lands of Mississippi. Its age is figured at 1,100 years.

At the right is shown a new type of hydraulic wheeler, the latest development in this form of machinery. The hydraulic lifting device swings several tons of logs into place, seemingly without effort. Note that a dozen big sticks are handled at one time, as compared with three or four in the case of the smaller wheelers on the opposite page. The machine is mounted on a set of caterpillar treads.

Caterpillar treads are used in winter to haul this load of cedar ties through Montana woods.

Mars Refuses to Answer Radio Messages



DESPITE numerous efforts to communicate with them, the inhabitants of the planet Mars have thus far been consistent in their refusal to have anything to do with the earth-folks at the other end of the telephone line. The latest evidence of the unsocial nature of the Martians came recently when Dr. H. Mansfield Robinson, shown in the picture at the left, attempted to send a message to a woman on Mars who, he reported, had been in communication with him. Although listeners all over the world were on the alert for her response, it failed to come through.

The instruments employed by Dr. Robinson were an ordinary wireless set and a device which he calls a psycho-telepathic motor-meter. Apparently the science of interplanetary communication is as yet a great deal short of perfection.

Dr. H. Mansfield Robinson is shown above with the wireless set with which he attempted to talk with a woman from the planet Mars.

FUEL FROM WELLS

OUT IN Capa, South Dakota, they don't worry about an impending coal shortage—they take their heat right out of an artesian well which spouts water heated by nature's fires to a temperature of 120 degrees. The well has been flowing for 20 years and shows no signs of slackening.

The well was originally drilled by a railroad company to obtain water for its locomotives. The hot water, however, contains so much solid matter that it "foamed," making it useless for boilers. Consequently the flow from the well was directed through heating coils in the railroad station house, where it maintains an even, comfortable temperature in chill weather. In the coldest weather a small stove supplements the natural heating system.

In addition to heating the station, the well supplies natural gas which forms the fuel supply for heating, lighting, and cooking of this little hamlet of 100 people.

PAPER FROM CORNSTALKS

NEWSPAPERS and books printed on paper made from cornstalks is a feat made possible by recent advances in chemical reclamation of waste products. A special 100-page edition of an Illinois newspaper was issued recently printed on cornstalk paper.

BIBLICAL CANDLESTICK

AN EXTRAORDINARY light standard built by J. E. Wells, a carpenter of Altadena, Cal., has aroused considerable interest among Bible students who declare that it bears an astonishing resemblance to a candlestick mentioned in the book of Revelations. Wells, who has never read Revelations, declares that the standard was built according to a vision and that it symbolizes the past and future of humanity.

The unusual light standard shown above is said to have been built after a description in the book of Revelations.

Cork Cutter Has Novel Job

IN A LITTLE shop in an out of the way corner of London a man with one of the most unusual jobs in the world sits at his workbench and cuts out thousands of specially shaped pieces of cork for his customers. The workman is Leopold Garas, shown in the photo at the left. The bulk of his business comes from physicians, wine merchants and distillers, but he also is a cork sculptor of no little claim to artistic fame. His masterpiece is a carving which he has named the "Escape of Napoleon From Elba." This is composed of thousands of tiny pieces of cork, carefully carved and glued together to form the finished statue.

AUTOS TO BE POWERED BY RADIO

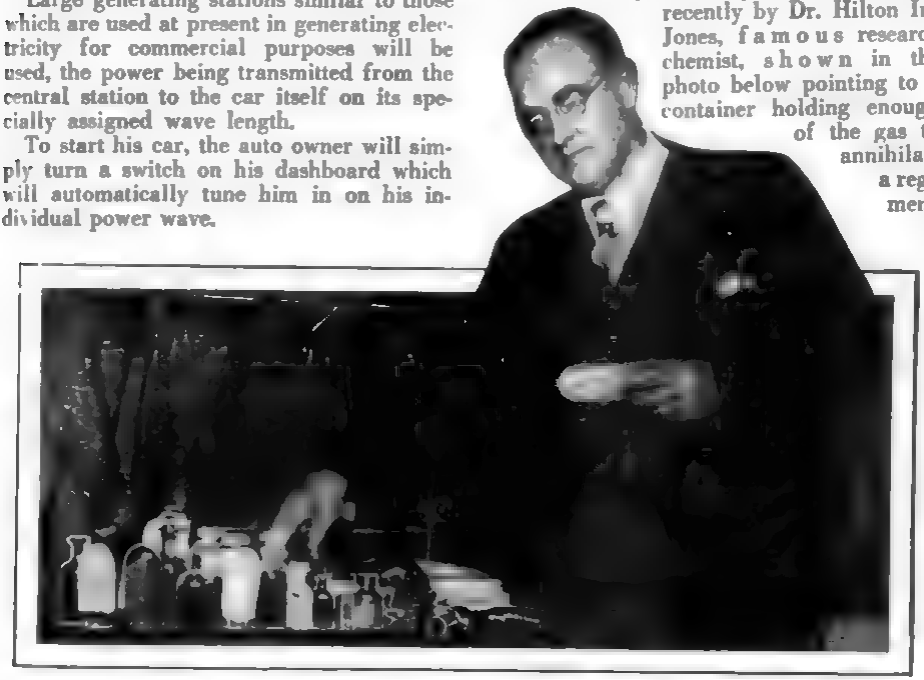
AUTOMOBILES which will be driven by electric motors receiving their power through centrally located transmitting stations are predicted for the future by G. M. Williams, president of the Marmon Motor Car Company, who predicts that the present type of gasoline driven auto will be obsolete before the twentieth century is over. Automobile engineers are said to be already designing radio-operated cars.

Large generating stations similar to those which are used at present in generating electricity for commercial purposes will be used, the power being transmitted from the central station to the car itself on its specially assigned wave length.

To start his car, the auto owner will simply turn a switch on his dashboard which will automatically tune him in on his individual power wave.

SCIENCE PERFECTS NEW DEADLY GASES

POISON gases so deadly that any man breathing them will be instantly killed are now available to the armies of the world in event of war. The new gas is called cacodyl isocyanide, and is powerful enough to wipe out whole armies if used in war. Discovery of this gas was announced recently by Dr. Hilton Ira Jones, famous research chemist, shown in the photo below pointing to a container holding enough of the gas to annihilate a regiment.



Dr. Hilton Ira Jones is shown above with some of his laboratory specimens, including a deadly new gas powerful enough to wipe out a large city or annihilate an army in wartime.

This Gun Replies to "Hands Up!" With Bullets

This new breast machine gun starts shooting when the wearer raises his hands.

IN THESE days of flying bullets and indiscriminate hold ups, the well dressed Chicagoan should wear a breast machine gun and armor vest such as is shown in the photo to the left. Samuel Schwarz recently invented these two pieces of equipment for every day wear. Instead of merely throwing up the hands when threatened by a hold up man the wearer can spray a stream of lead bullets in his face.

The strings that control the machine gun are held between the first and second finger of each hand. As the operator raises his hands and faces toward the gunman he can pull the string that controls the aim of the piece. When he has proper aim the other hand will pull the trigger.

BERLIN TO EXTEND SUBWAY

BERLIN plans to spend $250,000,000 in the next few years for the extension and construction of the underground system of subways. The present forty-eight miles of track will be increased by twenty-one miles by 1930 at a cost of $125,000,000.

It is then planned to build two new lines costing the same amount, over a construction period of fifteen years.

BERLIN CAFES ADOPT OLD PARIS CUSTOM

BERLIN open air cafe owners have adopted the old Parisian custom of placing coke stoves on their terraces. Patrons gather around one of these stoves as shown in the picture to the right and sip their afternoon coffee. These coke stoves throw a strong heat with very little smoke or ash. This capacity joined with lightness and safety makes them a practical addition to the cafe business. The open air store and cafe is a foreign business development that is popular on the continent.

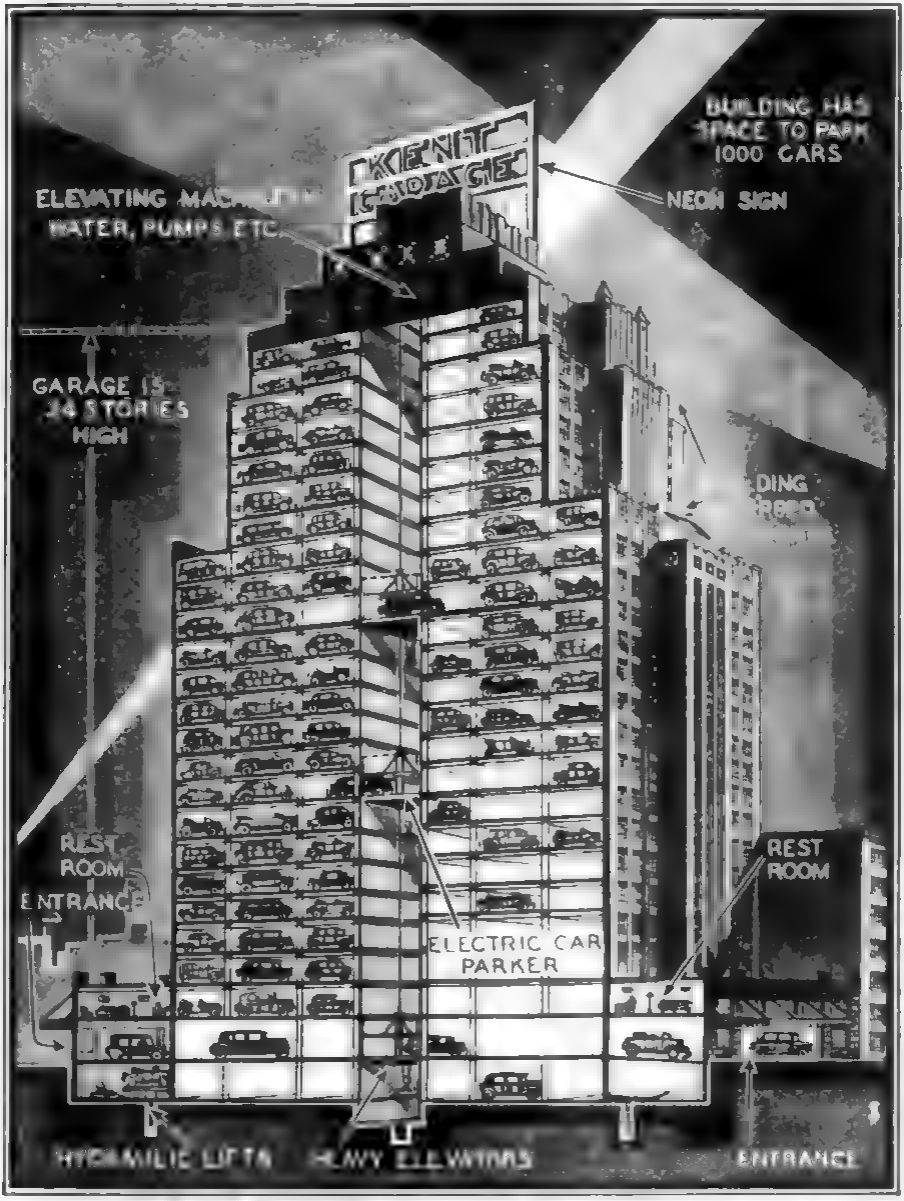
MICHELIN AIR CONTEST ON FRENCH CALENDAR

THE Michelin air contest is an annual event which has been in existence for over twenty years in France. It was won the first time by Wilbur Wright in 1908.

The event is open to pilots of all nationalities, but must be disputed on French territory. The distance to be covered is 3,000 kilometers (1,875 miles) with 15 landings at specific points. Only pilots are permitted to compete, and no other passenger is permitted aboard the competing plane.

The winner of the contest receives the sum of 30.000 francs ($1,200) in cash and a bronze copy of the cup.

HOTEL for AUTOS



Traffic congestion in New York City has become such a serious problem that a special parking garage, or more properly a hotel for automobiles, is now being erected near Times Square after the design pictured above. Cars are handled automatically—all the attendants have to do is drive the automobile onto the elevator, press the proper button, and the car is whisked to the correct floor and stored in its individual stall, all without the need of human assistance.

Perils and Rewards of

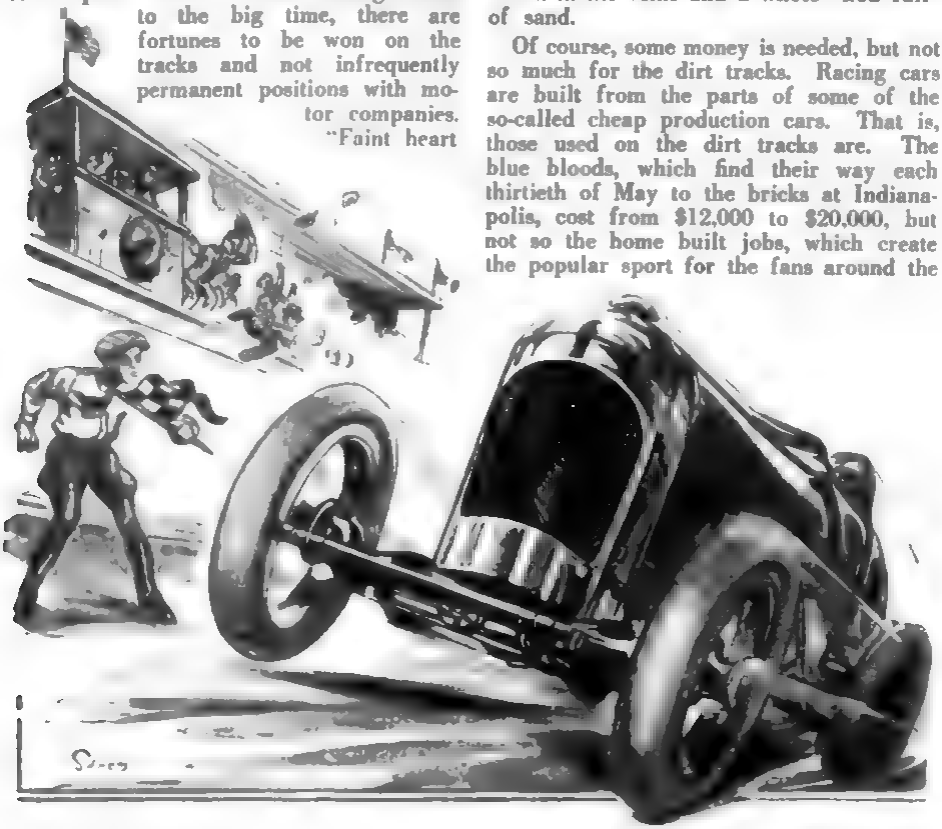
By RAY F. KUNS, Automotive Engineer

This article is one of a series on vocational subjects, showing the opportunities offered young men in various professions. Each month an expert in his line will outline for readers of Modern Mechanics the advantages of his particular vocation as a life-time work.

DIRT track racing is becoming a more popular sport each year. The "Boys" follow the circuit for the thrills and the money. Most drivers are their own engineers, experience is their teacher in getting the last hundred "revs" out of the product of the back lot workshop. The game is a challenge for nerve, skill and brains. The rewards are in the form of thrilling experiences, quickened intellect and the purses and prizes won. For those who graduate to the big time, there are fortunes to be won on the tracks and not infrequently permanent positions with motor companies. "Faint heart ne'er won fair lady," nor light foot an automobile race. It is a case of "give her the gun," get her out in front and keep her there.

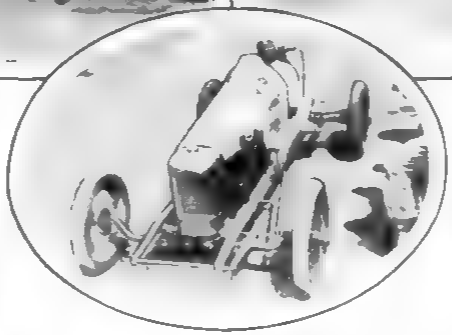
Automobile racing, which a few years ago seemed to be on the wane and fast becoming a sport for the rich, is coming into its own on the dirt tracks, scattered throughout the land. It is a game for the young man with a gift for mechanics, red blood in his veins and a whole "hod full" of sand.

Of course, some money is needed, but not so much for the dirt tracks. Racing cars are built from the parts of some of the so-called cheap production cars. That is, those used on the dirt tracks are. The blue bloods, which find their way each thirtieth of May to the bricks at Indianapolis, cost from $12,000 to $20,000, but not so the home built jobs, which create the popular sport for the fans around the



Dirt Track RACING

The two top pictures present typical scenes on the dirt tracks scattered all through the country, where races are held all through the season before state fair crowds and racing fans. The racers in the pictures are nearly all home built.



Are the rewards of dirt track racing worth while? Robert Carey, shown in the oval with his Chevrolet special, says they are—he has just won a sizable purse with his little car. An excellently performing racer can be built from stock parts of cheap production cars.

mile and half-mile circles at state and county fair grounds.

The cost is just about one-twentieth as much and if you can't figure that out then you have no business trying to figure out rear axle gear ratios, compression ratios, "prematuring," oil pressures, fuel systems, down-draft carburetors, piston clearances, bearing fit, balance and the many other things it is necessary to have just right to bring out the last "rev" in the old boat.

The race at Altoona, Pa., on last Labor Day was won by an R. & R. Chevrolet Special, at the amazing speed of 95.9 miles per hour. When it is remembered that the speed at the big league Indianapolis track, last Memorial Day, was 99.5 or less than four miles faster, it is seen that these dirt track jobs are fast.

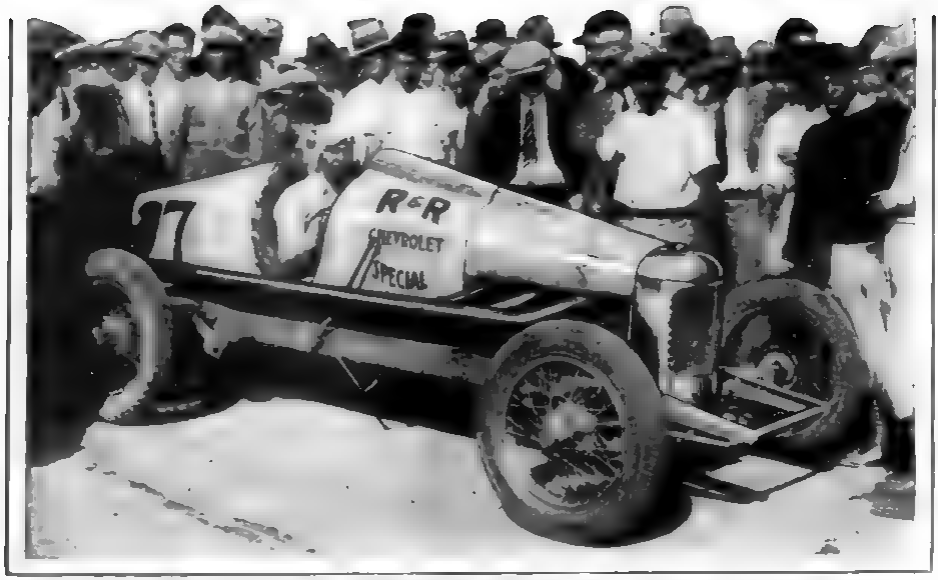
In most cases engines with displacement up to 300 inches are admitted to the dirt tracks. The cars are generally Fords or Chevrolets rebuilt for racing, with special speed equipment. Some dirt track cars are old speedway cars, picked up and rebuilt by the youthful enthusiast.

A dirt track racer is about 80% standard or stock parts, the rest is special, but considerable work is done to make the stock parts acceptable. Here are a few things which must be done.

Reduce the weight of the flywheel. Balance clutch, rods, flywheel, pistons, rings, crankshaft and other reciprocating parts. to the minutest limits. Drill the crankshaft (if not drilled) and provide 125 pounds oil pressure from a gear type pump. Increase the compression ratio from standard to as high as 9 to 1. Some drivers use as low as 6 to 1. Use special carburetors, manifolds and valves. Many times special rings are used. Pistons are provided with extra clearance. Bearings have greater clearance. The engine should "rev up" to 5,000.

Rear axle ratios vary with the tracks, about 4 to 1 being popular. Wire wheels are required. Steering wheels should be bronze or steel. Ford Model T steering gears and spindles are barred from A. A. A. sanctioned events. The most desirable wheel base is 90 to 95 inches. Standard tread is used by some cars and a narrow tread by others.

Not all races are run under the auspices



This type of racing car, as its name implies, is built up out of standard Chevrolet parts. A number of alterations must be made on the stock car parts, such as increasing the compression ratio and lightening the reciprocating members, but the total cost is moderate and the car will travel almost as fast as the hand built $20,000 cars which race at the Indianapolis track.

of the A. A. A. If it is desired to be registered as an A. A. A. driver, it is necessary to appear with your mount at a *sanctioned event* and have a registered driver pace or follow the applicant. The speed must be within seven seconds of the track record for the half-mile courses and within twelve seconds for the mile course. The fee for registering with the A. A. A. is $3.00.

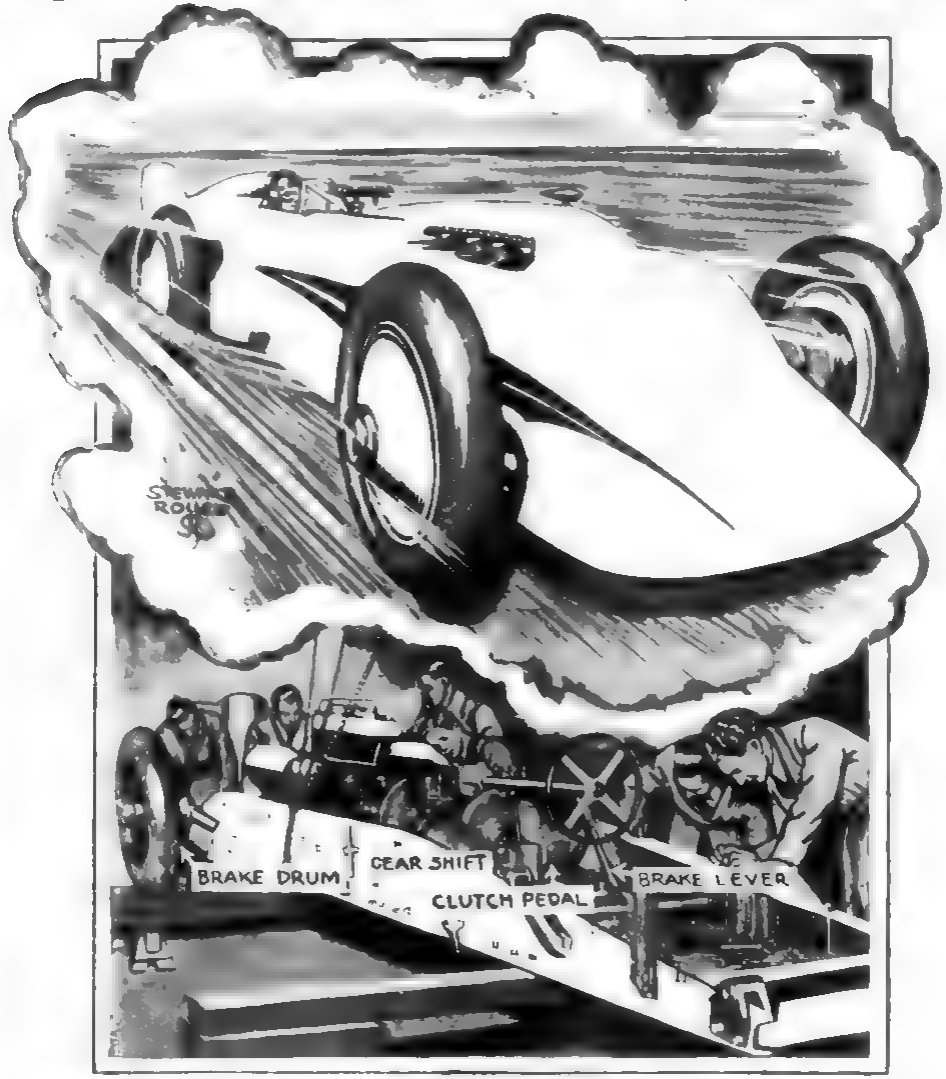
Registered or not, there are some things a driver never does. The fraternity is one of gentlemen. The new entrant will quickly absorb the atmosphere once he starts following the circuit. It is reported that in most parts of the country there is no dearth of opportunity to race. In some cases as many as three races per week, during the racing season, are offered to cars and drivers with reputation for performance. Once you have a speed creation which will "burn up the track," you will have plenty of bids to show your wares. Many of the drivers belong to dirt track circuits or teams and race on a regular schedule.

Mechanicians are here shown examining a Miller special. This type of racer is one of the finest built, costing about $20,000. It is entered only in the big races of the track.

The Big Time races have been won rather consistently within recent years by dirt track racers up for the first time. Dirt track training is good training even for the big time events. Rumor has it that this is to be the last year for the little 91 cubic inch engines on the big-time tracks. If this is true, the dirt track boys will come into their own in a real sense.

Purses of $2,500 and more for first place winners are common on the dirt tracks. Almost any racer with a heavy foot and a fast car can make a good living, even though he never comes into the big money. The smaller purses which are offered to cars breaking lap records, or coming under the wire in second or third or fourth place, are by no means to be "sneezed at."

Segrave's Golden Arrow is a $75,000.00 Racer



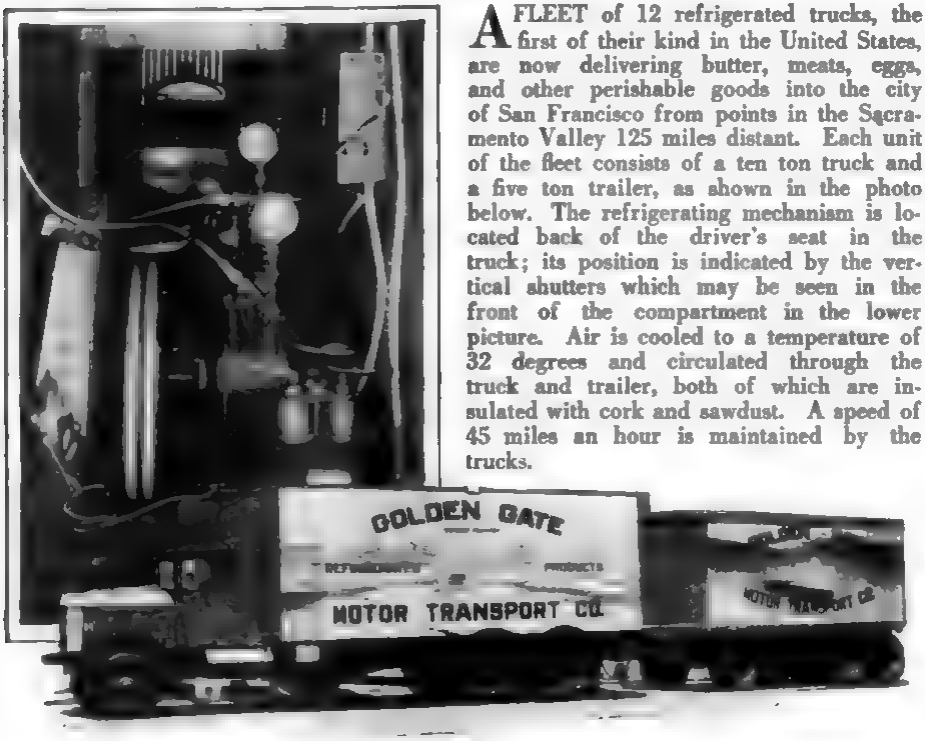
SIGHTING his objective as the big game hunter sights his quarry, using telescopic sights, Major H. O. D. Segrave, in his "Golden Arrow," shown above, is going after the world's speed record this month at Daytona Beach, Florida.

In the article by Mr. Kuns, concluding on the opposite page, the author describes the profession of dirt track racing and tells of speeds of 100 miles an hour attained by home built racing cars. Contrast this with the "Golden Arrow," which is expected to attain a speed of 240 miles an hour—four miles a minute!

In doing this, however, the big racer will roll over one of the most perfect race tracks in the world. The fine sand of Daytona Beach is pounded down by the ocean waves until it is perfectly smooth and almost as hard as concrete. Most of the world's speed records have been set on this course.

Construction features of the "Golden Arrow" are presented in further detail on page 138 of this issue.

Butter Trucks Have Complete Refrigeration Plant



A FLEET of 12 refrigerated trucks, the first of their kind in the United States, are now delivering butter, meats, eggs, and other perishable goods into the city of San Francisco from points in the Sacramento Valley 125 miles distant. Each unit of the fleet consists of a ten ton truck and a five ton trailer, as shown in the photo below. The refrigerating mechanism is located back of the driver's seat in the truck; its position is indicated by the vertical shutters which may be seen in the front of the compartment in the lower picture. Air is cooled to a temperature of 32 degrees and circulated through the truck and trailer, both of which are insulated with cork and sawdust. A speed of 45 miles an hour is maintained by the trucks.

VOICES FROM THE SKY

AN AIRPLANE equipped with an immense amplifying device which sends a flood of music pouring down out of the skies is now in use in New York for advertising purposes. The plane is named "The Voice of the Sky," and the effect of words seemingly coming from nowhere is said to be weird and startling to the person hearing the aerial broadcast for the first time.

SUN IS ENERGY SOURCE

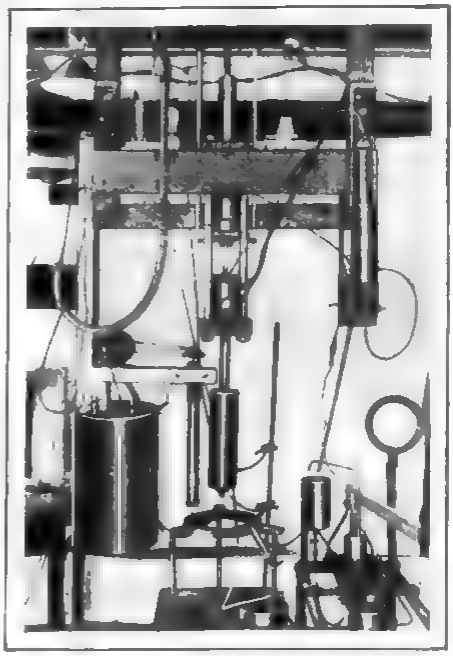
OPINIONS of some natural scientists that man will some day be able to break down atoms and derive power from the energy contained within them were given a set-back recently when Dr. Robert A. Millikan, famous physicist, declared that experiments led him to believe that man will never have any other source of energy than the sun. Radiation from Old Sol is the source of all energy now used by man.

DAREDEVIL STEERS BOAT WITH TEETH

STANDING on one's hands in the bottom of a speeding motorboat and steering the craft with the teeth is the latest thrill in outboard motoring, invented by "Skeets" Eckleberry, noted bronco buster. The photo below shows him "doing his stuff" while his boat skims along at 30 miles an hour in Biscayne Bay, Miami.

Machine Makes Hot Ice, Boils Eggs Below Zero

IMPOSSIBILITIES such as boiling eggs at below zero temperatures and producing hot ice are easily performed by a remarkable new machine invented by Prof. Percy W. Bridgman of Harvard University. These feats are made possible by the enormous pressures developed by the machine, which exerts a maximum pressure of 600,000 pounds to the square inch. This pressure is developed in the small cylindrical chamber shown in the exact center of the photograph at the right.

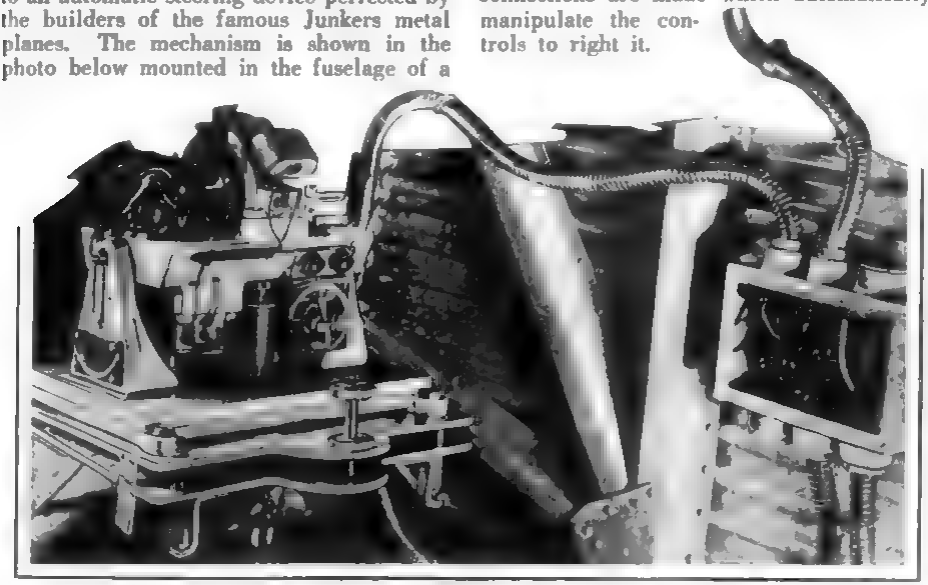


ACTION OF MOLECULES IS STUDIED

INDIVIDUAL gas molecules are now studied in an amazing new piece of apparatus developed by Dr. Frederick Keyes of the Massachusetts Institute of Technology. The chambers in which the molecules are studied are exhausted to almost perfect vacuums and the molecules remaining, traveling at a high rate of speed, pass through small holes somewhat after the fashion of light rays shooting through an aperture.

AUTOMATIC AIRPLANE STEERING DEVICE TESTED

NO LONGER need an airplane pilot keep his hands on the controls at all times while his machine is in the air, thanks to an automatic steering device perfected by the builders of the famous Junkers metal planes. The mechanism is shown in the photo below mounted in the fuselage of a Junkers plane. It employs the principle of the gyroscope, so that whenever the big plane departs from an even keel electrical connections are made which automatically manipulate the controls to right it.



Are You a Coo-Coo Inventor?

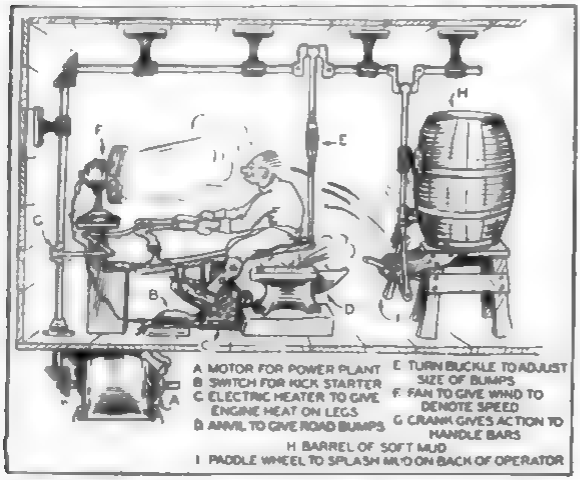
If you ever invented a "nut" device, send it to us —maybe you'll get a check for it!

MODERN MECHANICS' Coo-Coo Contraptions Contest is becoming more popular each issue. Contest No. 4, which closed March 1, 1929, was a real sticker for the Coo-Coo Editor. There were many high grade contraptions submitted and it was only after a lengthy consideration with his assistants that the contest winners were finally picked. The Editor announces that Contest No. 7 is now started and will continue until the closing date, June 1, 1929.

The prize winning contraption of Contest No. 4 is exceptionally good because it offers the reader a real study in detail. Just study the "Fool Fly Killer," on the opposite page. Hi Sibley of 1951 Brigden Blvd., Pasadena, California, crashed through with the prize winner and won the $25. He shows a sense of humor that is well worthy of comment from the Coo-Coo Editor, who thought the crack about the sardines moving over was a scream. Hi's sketch was clear and helped our artist make the final drawing. Remember though, boys, the Coo-Coo Contraption does not have to be a finished drawing to win. The thing that we are looking for is *humor*. All that you have to do is hit on some Coo-Coo idea.

After a long deliberation the second prize was picked. Imagine the shock that the Editor received when he found that the "Indoor Winter Motorcycle for Ambitious Fans" had no name on it. The contraption had such a funny slant that the board decided to give it the prize anyway. We have the contraption and shall await a claim of ownership from its submitter.

Five prizes of $3 each were awarded to the following contestants, whose entries were all top-notchers. Names of the winners are: Curtis W. Prendergast, 124 Eastwood Drive, San Francisco, California; Stockton Ferris, Jr., 2328 Bedford Ave., Brooklyn, N. Y.; Roy E. Orcutt, Raven, Alberta, Canada; George Taubert, 388 Columbus Ave., Pittsfield, Mass.; and Joe P. Carney, 512 West 50 street, New York City.



All the pleasures of motorcycle riding are cleverly combined in this Coo-Coo Contraption for snow-bound motorcycle fans. This device won second prize of $10, but the joke is on its designer—he forgot to put his name on his sketch! If he will write to the magazine, his check will be forwarded immediately by the Coo-Coo Editor.

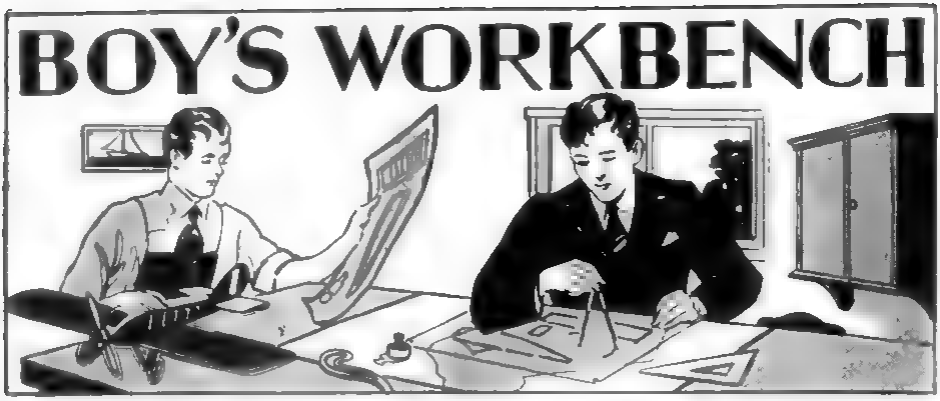
In Contest No. 7, announced herewith, the regulations are as follows: Prizes will total $50—a first prize of $25, second prize $10, and five prizes of $3 each. Closing date is June 1, 1929. Manuscripts received after this date will automatically be entered in Contest No. 8. No manuscripts will be returned; if you wish to preserve your contraption, be sure that you keep a copy. In case of a tie for any of the prizes, a duplicate prize will be awarded to each of the tying contestants. The contest is open to anyone except employees of Fawcett Publications, Inc. It is not necessary to be a subscriber to MODERN MECHANICS. Be sure to put your name on your sketch.

Get "hot" on a contraption and show the world just how Coo-Coo your idea can be!

This Fool Fly Killer Wins the Coo-Coo Contest First Prize of $25.00

This Coo-Coo Contraption is the work of Hi Sibley, 1954 Brigden Boulevard, Pasadena, Cal.

BOY'S WORKBENCH



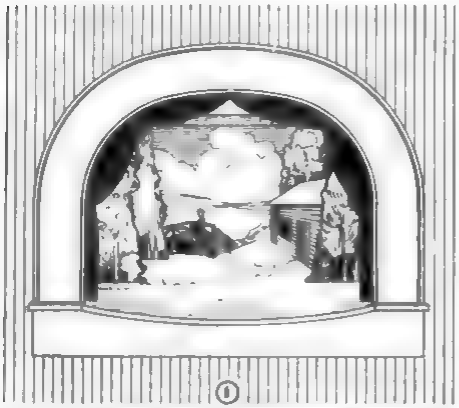
Edited by A. NEELY HALL

The editor of this department, which is a regular monthly feature of Modern Mechanics magazine, is known to boys throughout the country as an expert in designing things to be built in the home workshop. This month he presents plans for building your own theater where you can present movies and puppet shows!

Run Your Own Show With This Puppet Theater!

THIS can be a moving-picture theater, too, if you or your chum owns a projector. A reel of pictures thrown on the screen while scenes are being shifted will help to sustain interest.

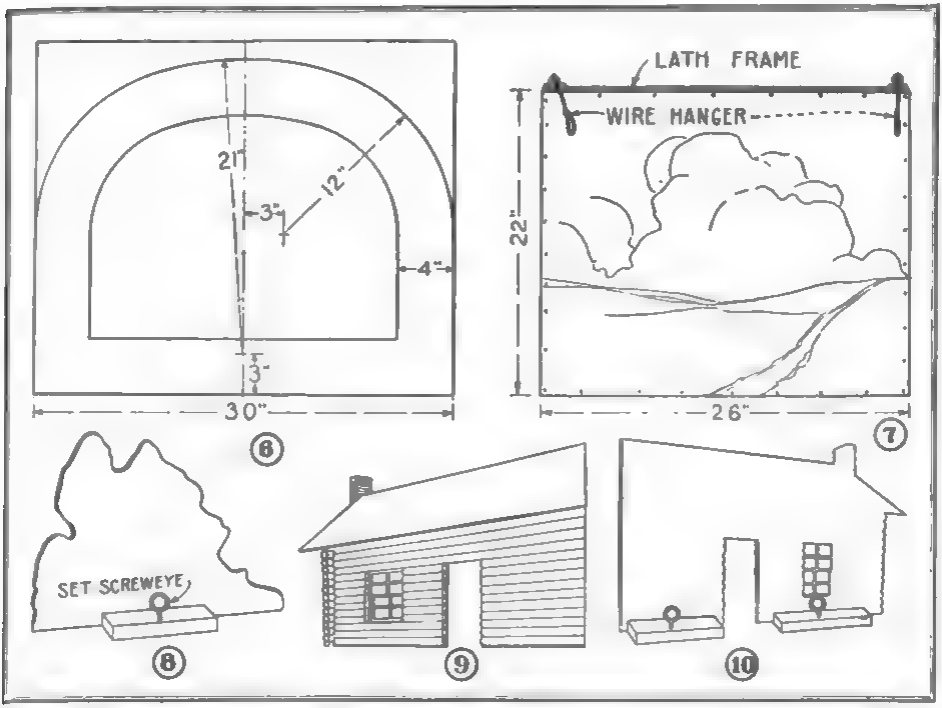
Figure 1 shows the home-made theater as the audience sees it out front. Above, below, and at each side, curtains are hung to conceal all but the proscenium. Fewer hangings will be required if you can set up the stage in a doorway.



Here is a front view of the puppet theater as it is seen by the audience. Note how the curtains are hung.

Figure 2 shows how the theater looks back stage. A card table is a good support, but a larger table, or boxes piled to an equal height, will do very well. Get a large shallow box for the stage. That shown in the illustration measures 20 inches wide and 24 inches long. To each corner of the box nail a piece of 1-by-2 about 36 inches long, and across these near their tops fasten a pair of laths, or similar strips, to form the gridiron, or support for scenery drops.

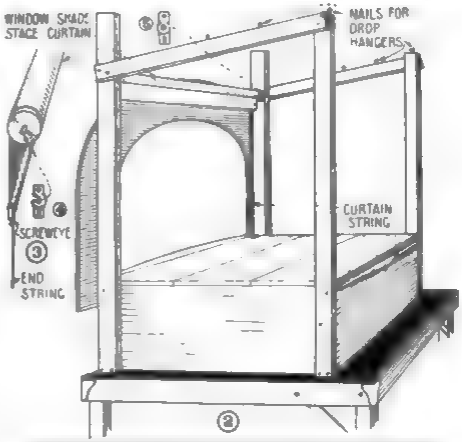
A gilt picture frame, with wide ornamental molding makes an excellent proscenium, but such a frame may not be available. Next best is a proscenium of wallboard. A pattern for laying one out is shown in Fig. 6. The given dimensions need not be followed, because the size is optional. Indeed, if the stage curtain is to be used as a screen for pictures, you may wish to make the proscenium opening 22 by 30 inches, which is a standard size for small screens. When you have laid out the proscenium, cut it out with a saw, and smooth up the sawed edges with a file and sandpaper. Buy strips of narrow molding at a lumber yard or a picture frame store, for trimming the arch, steam them or soak them in hot water, bend them to fit around the inside and outside edger of the arch,



Individual sections of the theater's scenic accessories are here shown, together with the screw-eye method used by the scene shifter in anchoring his sets to the stage floor.

and when the wood has dried fasten to the wallboard with glue and short nails. You can further ornament the arch by stippling the moldings and the space between them with plastic wood, then giving all surfaces a coat of shellac and a coat of radiator bronze.

There should be two stage curtains, one of velvet or other heavy material, the other a window shade. The velvet curtain need not be made to lower. Loop it in two places on each side of the proscenium, and fasten it with cord, as shown. The shade roller may be an old one. If the shade material is torn, replace it with oil cloth, glossy side in. The dull side may be coated with varnish, then dusted with radiator aluminum powder to make a silver-screen for pictures. Screw a small screw-eye into the shade stick, close to each end, and tie a cord to each screweye by which to operate the curtain (Fig. 3). Cut the roller to fit between the corner posts of the stage framework, and put up the end fixtures (Figs. 4 and 5) for the roller to turn in. Run the curtain strings through holes bored through the stage, then under the



Back quarter view of the stage, showing method of framing. Use an old packing box.

stage to the back, and out through holes in the box. Join the string ends.

You will need several laths for frames, a roll of wall paper for covering material, and crayons or water colors for scenic painting. Figure 7 suggests a layout for a back drop. A stream is shown coming down from the hills. Note in the scene setting of Fig. 1 how this stream is continued across the stage to the right, and a foot bridge is built over it. The stage portion of the stream is a piece of mirror. The rustic bridge is built of pieces of tree branches glued together.

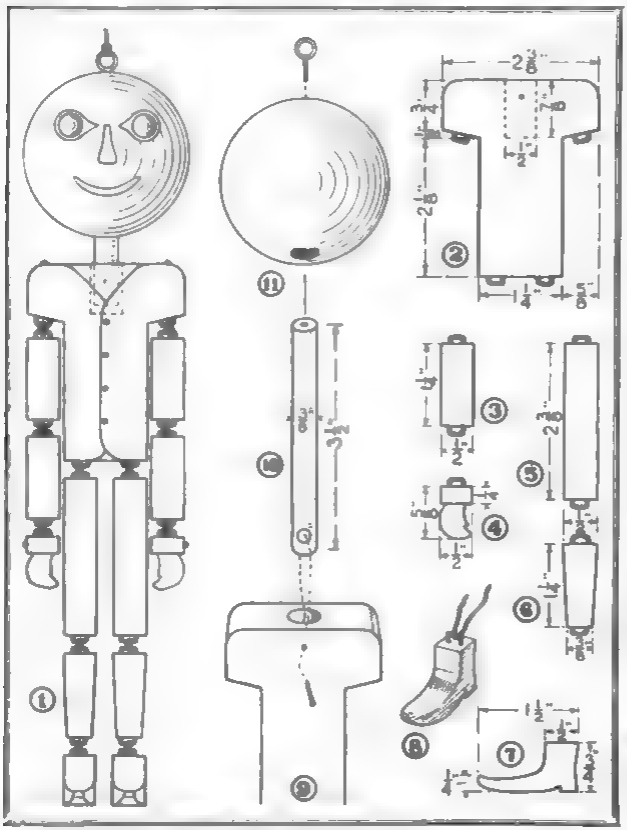
In addition to the back drop, sky drops and wings are needed to prevent the audience from seeing through the top and sides of the stage.

Tree and shrubbery wings are shown in the setting of Fig. 1. Draw and color these upon cardboard or wallboard, cut them out, and mount upon blocks of wood as shown in Fig. 8. Drive a screweye through each block, for fastening the wings to the stage. The scene illustrated has a cabin. Lay it out upon cardboard as indicated in the sketch of Fig. 9, cut the door and window openings, and color with crayons or water colors. Then mount upon base blocks (Fig. 10).

Figure 11 shows how to rig up the threads for manipulating the puppets. The two crossed sticks from which threads run to the ears, back and hands of the puppet, are held by the puppeteer in one hand, and the single stick from which threads run to the knees, is held in the other hand, while the puppet is performing.

HOW TO MAKE A DANCING PUPPET

INSTEAD of manipulating the feet of this puppet with strings, you make them dance by vibrating the dancing platform with your fingers, as indicated in the photograph. The platform is a shingle or thin board, and it is held upon a chair with your knee, so as much as possible of its length projects. Light tapping upon the board produces simple foot movements, fast, heavy tapping produces lively movements, and with a little practice it is possible to make the puppet dance to one's whistling or any other accompaniment, in slow or fast time.



The puppet is of simple construction, as you will see by the diagram of Fig. 1. Figure 2 is a pattern for the body block, Fig. 3 is a pattern for the arm blocks, Fig. 4 is a pattern for the hands, Fig. 5 is a pattern for the blocks that form the upper portion of the legs, Fig. 6 is a pattern for the blocks that form the lower portion of the legs, and Fig. 7 is a pattern for the feet. A board ½-inch thick is right for working material.

After marking out the blocks, saw them out and sandpaper their surfaces. A knife and a file will be helpful in shaping the hands and

feet. Figure 8 shows how to shape the toe of the shoes.

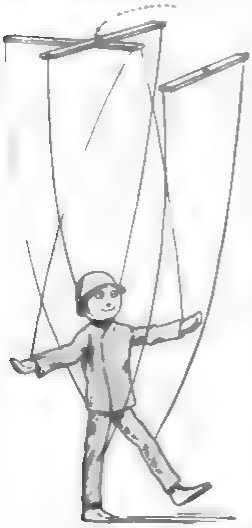
The body, arms and limbs are assembled with string attached to tacks. The diagrams show the use of double-pointed tacks, but any kind to which string can be attached will do. Tie the strings loosely so the joints will work freely.

Bore a ½-inch hole ⅞-inch deep in the body (Figs. 2 and 9) to receive the neck. For the neck use a piece of ⅜-inch dowel stick, or stick whittled to this diameter, 3½ inches long (Fig. 10). Drill a 3/16-inch hole through the neck stick near one end for the brad pivot that fastens the neck to the body.

The head is a rubber ball (Fig. 11). Cut a hole in the ball, push the neck stick through the hole as far as the opposite side of the ball, and screw a small screweye through the ball and into the end of the stick. Drill a hole in the stick end so the screw will drive in without splitting the stick.

Finish the puppet with lacquer or enamel colors. It will be easiest to finish the parts before assembling them. In finishing the model, black was used for the head, hands and feet, red for the coat, green for the trouser legs, and yellow for the stockings. Eyes, nose and mouth were painted with white. Round-head brass nails were used for eye pupils, and tiny round-headed brass tacks for coat buttons.

Fasten a string or thread to the head screweye to slip over your second finger, and fasten another string to each wrist and make loops in the ends, one to slip over your little finger, the other over your thumb.



The drawing at the left shows the method of puppet control used by professionals.

The cross-bars serve to keep the strings from tangling.

A few of the pointers observed by professional puppeteers in presenting their performers may well be observed by the amateur. The theatre furnishings must, first of all, be kept in exact proportion to the dimensions of the puppets. The controlling strings must not be so heavy, or of such contrasting colors that they are easily seen against the stage background. When the show is over, it makes an effective "curtain" if the human performers will stand alongside their carven characters to show just how small they really are.

The dancing puppet all ready to perform his act. Observe the platform under the operator's fingers which imparts a dancing movement to the puppet's feet.

Carboloy, Hardest Metal, Will Cut Tool-Steel

METAL that will cut tool-steel, glass or concrete with comparative ease has been discovered by Dr. Samuel L. Hoyt, research engineer of the General Electric company, Philadelphia, who announced the development of "carboloy" at the annual convention of the American Society for Steel Treating.

Dr. Hoyt is shown holding pieces of glazed porcelain and bakelite that were cut with carboloy tools. In the other hand he is holding lathe-cutting tools made of carboloy.

Development of this new metal is the result of an intensive research on the part of Dr. Hoyt. He has now succeeded in producing a metal that is expected to revolutionize industries concerned with the treatment of steel. Through the use of carboloy, tool-steel may be fashioned as easily as a sculptor models clay.

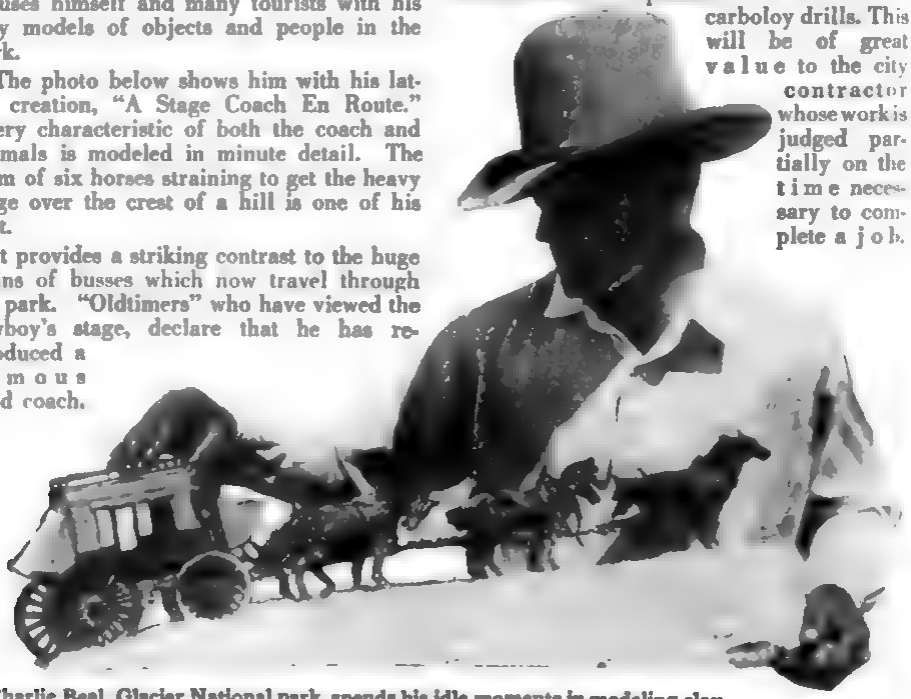
Contractors and pavement companies also welcome the discovery. Drills that can withstand the terrific friction involved in cutting concrete have long been looked for. Great reduction in the time now required to tear out a section of pavement or structure-concrete will be possible with the use of carboloy drills. This will be of great value to the city contractor whose work is judged partially on the time necessary to complete a job.

COWBOY IS SCULPTOR

PERHAPS Charlie Beal made mud pies when he was a kid. At any rate, the erstwhile Glacier National park cowboy amuses himself and many tourists with his clay models of objects and people in the park.

The photo below shows him with his latest creation, "A Stage Coach En Route." Every characteristic of both the coach and animals is modeled in minute detail. The team of six horses straining to get the heavy stage over the crest of a hill is one of his best.

It provides a striking contrast to the huge trains of busses which now travel through the park. "Oldtimers" who have viewed the cowboy's stage, declare that he has reproduced a famous old coach.



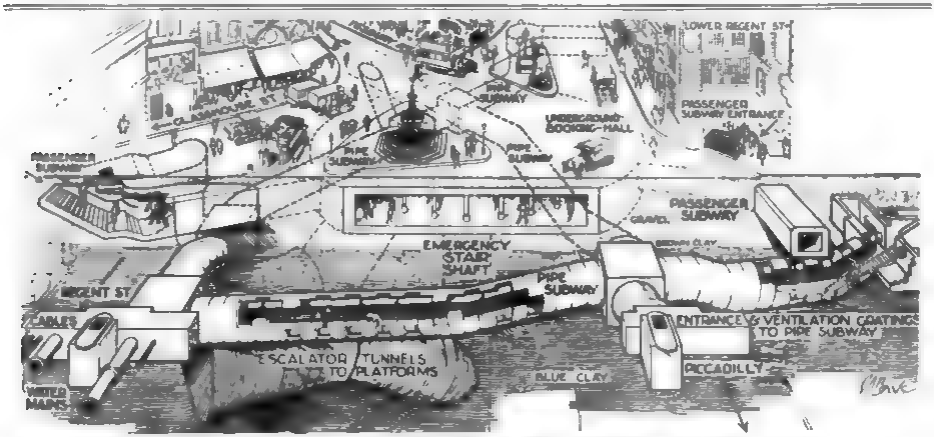
Charlie Beal, Glacier National park, spends his idle moments in modeling clay.

Moving Stairs Feature London's Subway Station

Piccadilly Circus Station, London's newest subway station, was recently completed after four years' construction work and is now ready for use.

COMPLETED at a cost of $2,500,000, London's new Piccadilly Circus subway station is fitted with all the latest devices to add to the comfort of passengers. The above photo shows one of the escalators, which travels at a rate of 100 feet a minute. The posts in the railings on either side of the center stairway contain spotlights which shine upward on the curved white roof of the escalator, their reflection giving indirect lighting.

The girls at the right are examining one of the mechanical train indicators which shows the positions of the various trains on the six lines leading from the Piccadilly station. Every time a train passes it is recorded by a little inked pointer on one of the six circular recorders in the photograph.



The above drawing shows how the Piccadilly Circus station is laid out underground.

Intricate Machine Fits Men to Jobs

A MACHINE known as a mechanical correlator which takes certain information about an individual and after a few minutes' work tells him just what occupation he should pursue has been used with success in fitting men into the right jobs. The machine operates on a pneumatic principle, using a perforated paper roll similar to that which produces music in player pianos. In an incredibly short space of minutes it makes calculations which involve more than 2,000 separate multiplications. It was devised to tabulate the results of 60 distinct pyschological tests.

Scores made by an individual in each of these tests are fed into the machine and it computes from this information the occupations for which the individual is best suited. The National Research Council at Washington has cooperated in the development of the electrical calculator. Modified machines of this type may soon be used in testing school children.

PREDICT FUTURE OF SYNTHETIC FOODS

SYNTHETIC food, synthetic clothes, even synthetic wars are visioned for the future by American chemists. Vegetables are to be replaced by a new type of plant, probably to be grown on the Sahara Desert, which will absorb tremendous amounts of energy from the sun. Sugars and fats will come from shale oil, sawdust and coal. Vitamins will be produced artificially, and by regulating the quantity and quality of vitamins consumed scientists expect to influence the size and complexion of human beings. In wars waged by these synthetic civilizations of the future it is probable that aviators will fly over large cities and release concentrated anesthetics to such good effect that the city will easily be captured.

Sock 'em!

MOVIE STARS TURN GYMNASTS

MUSCLE building equipment of the gymnasium is much favored by movie folk to keep in shape for their strenuous profession. Weight lifting machines, parallel bars, and even trapeze are used by stars of the silver screen, two of whom are pictured in the photos at the right going through their daily dozen. Marion Davies, above, is attacking a dummy who seems to be a bear for punishment—anyhow, he takes a left hook to the nose without even a wink of the eye.

Steam Auto Truck Built in 1895 is Still in Service

ONE OF THE first "horseless carriages" ever built is still in active service at Basingbroke, England, transporting passengers and freight. It is not a gasoline motor, however, but is driven by steam, and in its day was considered the last word in transportation. That it was sturdily built and soundly designed seems demonstrated by the fact that today, after 33 years of service, it is still in daily use. Note how closely the design is patterned after the lines of a wagon, even to the wheels with their stout spokes and iron tires. The body is little more than a box set on wheels, with a roof over the top to shade the passengers. The boiler is located directly behind the driver's compartment, and the driving mechanism is all exposed beneath the body of the machine. Climbing into the van is something of a problem, since there are no doors.

FREIGHT TRAINS TO CROSS SEA TO CUBA

THROUGH use of a ship which carries railway cars as cargo, freight trains a mile long will soon be going to sea. The Overseas Railway, Inc., is undertaking to carry American freight trains across the sea to Cuba, where they will be unloaded onto Cuban rails to travel into the interior to discharge their cargoes. The "Seatrain," as the car-carrying ship is called, is fitted with rails in its decks upon which the cars are unloaded by giant cranes. Each of the ship's four levels has four sets of rails. Slow piece-meal unloading of ocean-going goods will be eliminated by the new system.

EGGS TO BE SOLD BY THE PACKAGE

INSTEAD of asking for a dozen eggs, housewives will buy them by the package just like breakfast food if the new method of packing shown above becomes popular. Eggs are individually packed in corrugated cardboard jackets and shipped in cartons which keep their contents practically unbreakable.

The Loening Amphibian, the type of ship used by Lindy in the inauguration of the Honduras airmail line, is shown above as a landplane. The method by which the wheels are folded is here explained.

The "Why" of the Flying Boat

By WESTON FARMER

Have you ever wondered how an amphibian's wheels were drawn into the hull, and then extended for landing? This article, the third in a series, explains in simple language the factors required in a good amphibian design.

WELL, gang, here we are looking over amphibians! For the benefit of you who have not been followin' this series, let us review things a bit.

Useful as flying boats are, they have their limitations. They are heavier and slower for given powers, almost without exception. The seaplane, or the one or two float type of landplane on pontoons, is also limited. To be really universally independent of the land, the plane of the future must be able to land wherever called upon to do so. In other words, paradoxical as it may seem, to be independent of land, the plane must be adaptable to all landing conditions.

This calls for a plane which will land on either sea or terra firma. The flier then may pick an air route from point to point, secure in the knowledge that his plane can "make the grade" in a forced landing.

Since the Loening is typical of all of the amphibians, capable of splendid performance either as a land or as a sea plane, let us see how she works.

First, the designer has solved the problem of retracting the landing gear by a very clever mechanism which is motor driven and which will retract or extract the wheels in 12 seconds time at the pilot's will by the mere effort of pushing a button on the dash.

The diagrams accompanying show how the gear is worked. Substantially the same arrangements are used on other amphibians. The Loening patent uses a long worm which as it rotates draws the shock absorbing

member within the hull. The wheel is so hinged that the receding member will pull the wheel up on a steel tube frame which acts in the capacity of a bell crank in obtaining the desired motion.

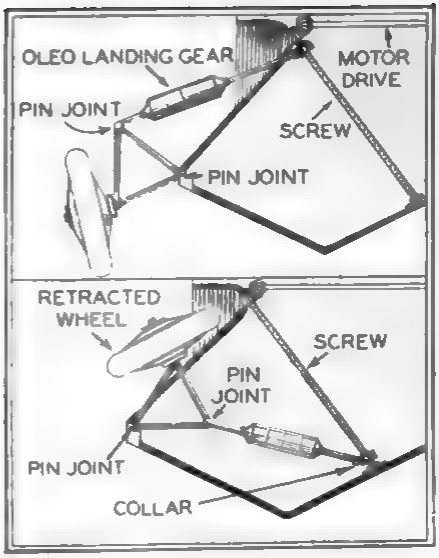
All Amphibians have to be very carefully engineered so that the center of lateral, or sidewise resistance, comes near the center of gravity so that stability in the air will result.

There you are! That flash will serve to give the opening wedge to a knowledge of amphibs, and in closing I want to say a word or two about the floats shown in the picture at the foot of this page.

This drawing shows the Heath Parasol with the same type of aluminum pontoons suggested for the Baby Bullet last issue. The ship has never been tried, true enough, but Ed. Heath, the designer of the plane, and the writer believe that the Henderson would neatly handle the floats, as they would weigh but little more than the wheeled undercarriage, and the resistance of floats, as aeronautical engineers know, is sometimes even less than that of an adequate undercarriage for a wheeled landing gear for the same type of plane.

Think of the fun you could have with such an outfit! Camping, speed, week-end trips—all the wonderful freedom of the air!

About the time this falls into the hands of the MODERN MECHANICS Hangar Gang, the magazine will be possessed of one of



the ships and bearing the MODERN MECHANICS logotype, experiments will be made to determine exactly how airworthy a Henderson powered seaplane job would be. Later results will be announced along with the other good things we are "framing" for our readers, and if successful, full plans for light pontoons will be published as a sequel to the Heath Parasol story. Until then bide yer time, gang, and let us hear from ye if yer interested.

So long!

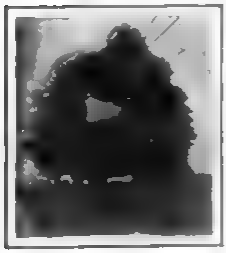
With a set of stout, light pontoons, the Heath Parasol will shortly be tried to determine the flying qualities of the ship as a seaplane. The drawing in the upper corner gives structural details of the patented retracting mechanism of the Loening amphibian.

Englishman Wins Fame for Quaint Wood Carvings

Using scraps of wood picked up in a nearby forest, Tom Charman of Godshill, England, carves quaint wooden statues in all sorts of fantastic forms which have won the acclaim of connoisseurs for their artistic merit. At the left the wood carver and his wife are fashioning fantastic walking sticks from waste wood.

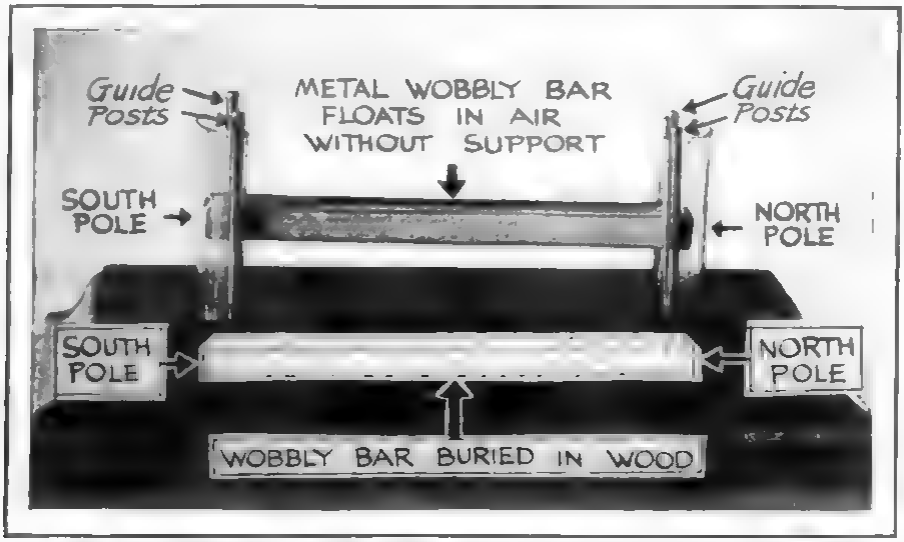
TOM CHARMAN of Godshill, England, "made a better mousetrap" than his neighbors and consequently the whole world is beating a path to his door. His quaint wood carvings have attracted so much attention from European artists that an exhibition of his statuettes is soon to be held in London. He lives in an unpretentious hut and secures the materials for his carvings by picking up tree branches and odd pieces of wood from a forest near his home. His only equipment is a knife and one or two engraving tools. A piece of wood of unusual shape is often the inspiration for one of his carvings. In the top photo he is shown with a gnarled piece of wood which with a twist or two of his knife he has converted into a squirming eel. The other photos show his method of working, together with a few of his carvings.

TELEPHONE WIRES RUN THROUGH TREE



RATHER than cut down an oak tree which grew directly in the way of a telephone line which was being erected in Wexford County, Michigan, the company cut an opening directly through the tree large enough to permit the wires to pass through without marring the oak. The rectangular opening is large enough so that the branches and leaves do not interfere with the wires, and all that is necessary to keep the opening clear is to trim away the foliage once a year. This opening does away with the necessity of cutting down the tree entirely or of cutting off the top, as is frequently done.

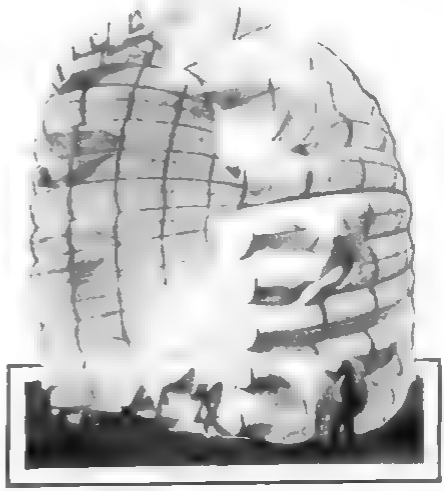
Metal Bar Floated in Air by Magnetic Repulsion



AN IRON bar which floats in the air in apparent defiance of the law of gravity was recently exhibited by the physics department of the University of California, but the professors made no claim to supernatural ability. The metal "wobbly bar" floated between two guide posts on either end of a wooden base in which they were mounted. The secret of the seemingly inexplicable phenomenon of floating metal lies in a duplicate bar buried in the wooden base with the magnetic poles arranged as shown in the drawing above. The floating bar was actually supported by invisible lines of magnetic force repelling similar poles. Cobalt steel was the metal employed, since it can be magnetized more strongly than any other metal.

LARGEST PARACHUTE WILL LOWER AIRPLANES

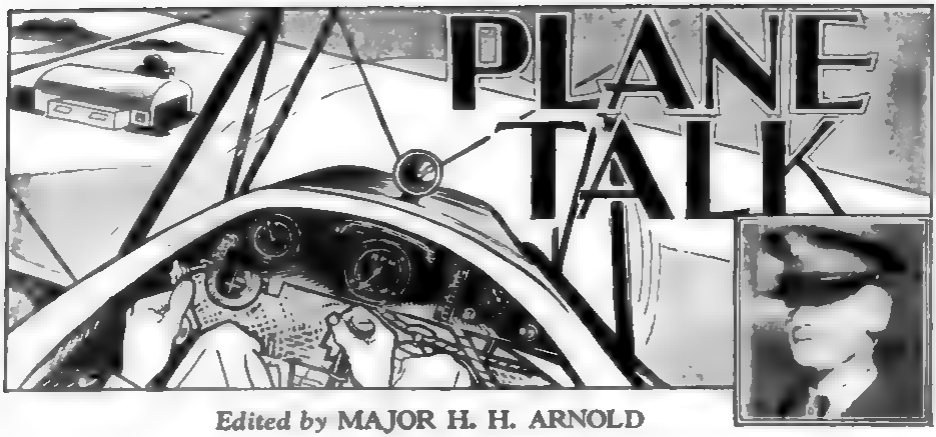
MEASURING 84 feet in diameter, the largest parachute in the world has been built for lowering disabled airplanes to the ground in safety. The chute, pictured at the right, was designed by Herd McClellan of Los Angeles, Cal. It has an area of 4,455 square feet. Note the ballonets on the edge of the parachute which help to open it after the release cord has been pulled.



Above is the largest parachute in the world, 84 feet in diameter. Note man in foreground.

ELEPHANT DISPLACES LION AS KING OF BEASTS

LIONS have been enjoying the title of "King of Beasts" which really belongs to the elephant, according to Harry C. Ostrander, naturalist. The elephant does not possess the regal bearing of the lion, but he can think faster and has a remarkable memory, as witness the truism of the showmen, "an elephant never forgets an injury."



Edited by MAJOR H. H. ARNOLD

As editor of this department, Major Arnold keeps the readers of Modern Mechanics abreast of the latest developments in aviation. Major Arnold "won his wings" at the very beginning of the science of flying, being a personal friend of Orville Wright and one of that small company of enthusiasts which visioned the possibilities of aviation during its early days.

Taking Photos From a Height of Seven Miles!

AERIAL photographs may be classed under one of two headings—oblique or vertical, depending upon the position of the axis of the camera with reference to the earth's surface when the pictures are taken. When several verticals are taken with one exposure, a composite vertical is secured. By arranging several verticals so that a continuous representation of the earth's surface is obtained, an aerial mosaic results. Stereoscopic results may be obtained from either verticals or obliques. All aerial photographs come under one of the above heads.

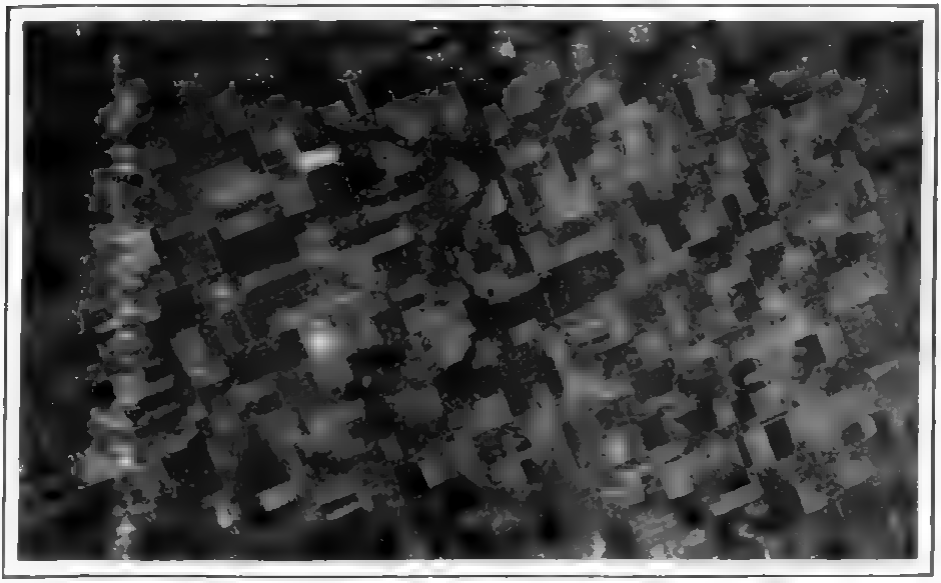
Here is pictured the equipment necessary for high altitude picture making. The fliers wear electrically heated suits and goggles. The jug-like holders in the foreground contain liquid oxygen. At the left is the camera.

The U. S. Army Air Corps has been conducting experiments with a view of checking the feasibility of determining the altitude of airplanes from photographs and of securing photos at the extreme altitudes.

During such tests it is necessary that every precaution be taken to ensure the working efficiency of the plane and its occupants. On account of the rarefied air it is essential that the engines be equipped with superchargers. Thus the power delivered above 25,000 feet is somewhere near that delivered at sea level. Oxygen must be carried for the personnel. In the past compressed oxygen has been used. The recent tests proved the practicability of liquid oxygen.

Due to the extreme cold, unless special provisions are made the goggles cloud making visibility impossible. Accordingly the airmen wear electrically heated goggles.

Countryside Looks Like Picture Puzzle at 39,000 Foot Elevation



This aerial picture was taken at a height of 39,000 feet and shows how the countryside takes on the appearance of a patchwork quilt with the fields of the farmers becoming rectangles of various shades. The width of this picture represents a ground distance of six miles. The spots of light at the left come from a "light leak" in the film shifting mechanism of the camera.

They also have electrically heated clothing and gloves.

The most recent test, that of Captains Stevens and Street, brought out many interesting facts. They left the ground on October 10th last. When they reached 26,000 feet, Street pushed both his throttle and supercharger control wide open. The plane reached its ceiling at an indicated altitude of 40,200 feet. Stevens took several photographs while the plane was at or around its highest altitude. The temperature at that altitude was 76 degrees below zero Fahrenheit. When they had completed their tests, Street nosed the plane down.

Everything was normal until they reached an altitude of 34,000 feet. Seventeen minutes later they were still at that altitude. Street worked for twenty minutes endeavoring to pull back the throttle and supercharger controls but with no success. He was afraid to dive the plane as the stresses induced might cause the plane to fall to pieces at that altitude. They were literally stuck in the air. Street was afraid to cut his switches as then the water in the engine would freeze and the jackets burst. There was nothing to do but cruise around until the gasoline supply was exhausted.

Shortly thereafter the engine began to pop and spit and they started toward mother earth. At 31,000 feet Street located their position as being between Richmond and Indianapolis, Indiana. They were 70 miles from their home airport at Dayton and could not possibly reach it.

Street made a remarkable landing with a dead stick for a high altitude plane flies much like a barn door at low altitudes. It was not until they had landed that the reason for their unusual predicament dawned upon the two airmen. The plane had been in a very cold region for about forty minutes. This extreme cold caused the metal parts of the throttle and supercharger controls to shrink to such an extent that they could not be moved.

Now as to the actual altitude reached. The Federation Aeronautique Internationale set it at 37,854 ft. The Bureau of Standards made it 39,606 feet. Captain Stevens and the Corps of Engineers by the use of the photographs and a carefully measured base line of 188,987.92 feet figured it to be 39,050 ft. It is a case of take your choice.

Here's what happens when an airplane crashes into a concrete wall at 100 miles an hour! This test crash was conducted to determine causes of fire when an airplane crashes. Note the puddle of gasoline in the foreground. The wreckage was complete, but no fire resulted.

Crashing Airplanes to Test Cause of Fires

GENERALLY speaking, it is rarely indeed that an aviator will admit that he fears anything connected with aviation. Experienced pilots fly into the worst kind of a snow storm without the least sign of fear. They take their planes into the thickest fog without turning a hair. Their engines quit in the air and they land safely with steady hands. However, there is one danger connected with aviation that has them all guessing, and that is fire.

There are many instances on record where pilots have had their planes catch fire in the air. Quite frequently they have slipped their planes through the air, landed and jumped when the plane was rolling along the ground and saved their lives. Sometimes they were able to extinguish the flames while slipping through the air. There were times when the pilots were not so fortunate and were burned to death before the plane reached the ground.

Two planes may crash on an airdrome in the same way. In one the aviators come through with a bad shaking up, but in the other, for reasons apparently unknown, the plane catches fire. Planes have caught fire when they crashed in the heaviest kind of rain, in snow storms, and even when they hit in shallow water. What causes the fires?

At first glance the answer is apparent: it is the gasoline. Perhaps that is the right answer and perhaps not. What started the fire—hot exhaust stacks, ignition system, the exhaust gases or some frictional sparks? Did the fire start instantaneously or was there an appreciable time b e t w e e n the crashes and the fire? Can a fire start after a crash with long exhaust stacks? Will a crash-proof gas tank eliminate fires? These are some of the questions the engineers wanted answered before they could intelligently start working on the problem of fires resulting from crashes.

The engineering division of the U. S. Air Corps decided that the best results could be obtained in solving the fire after crash problem by reproducing as near as possible the conditions under which planes crashed. Accordingly, a long sloping track was erected from which the airplane was

launched with approximate crash speed. A short distance from the end of the track a concrete wall was built. These two structures were sufficient for the actual tests, but not for the necessary data which was desired. An armored building, a short distance away, provided for photographers and observers, completed the layout.

As the wings of the planes did not affect the fire in any way, they were removed before a test was made. Otherwise the planes used were complete in so far as the gasoline and ignition systems and engine installations were concerned.

The first step in all tests was to equip the engine with the particular installation desired. The fuselage was then taken to the high end of the track, landing wheels placed in their grooves and engine started. When the engine was running at about the normal flying temperature, the fuselage was released. The propeller and the grade of the track accelerated the fuselage until it reached flying speed. At about that time the wheels left the track, the nose of the fuselage hit the crash wall and fragments of metal, wood and fabric together with a mist of gasoline and oil were thrown in all directions.

These crash tests brought out some very interesting information. For instance, it was found that the kind of ignition used had very little effect upon whether or not a fire started after a crash. Naturally, if a battery was used and the terminals were shortcircuited, a spark resulted, but batteries are easily insulated against such a thing happening.

The type of gasoline tank used did not seem to influence the fire one way or another. There were crashes in which gasoline was thrown in all directions and lay on the ground in a regular pool, and yet the wreck did not catch on fire. Obviously there was something more to the fires than ignition and gasoline.

One of the strangest things discovered was that fires started almost always in planes equipped with long exhaust stacks. With short stacks or no stacks at all the fires were much less frequent. With certain types of short exhaust stacks it was practically impossible to secure a fire after a crash, regardless of the other installations used. With other long stacks a fire started every time, regardless of the manner in which the gas tanks were installed or type of ignition used.

It is by carrying out such tests as these that aviation is brought up to its present day standard of safety. It is interesting to note, however, that probably not one man in a hundred would have known that long exhaust stacks were the greatest of all fire hazards in an airplane had it not been for the crash tests.

Another test crash! This picture shows the elevated railing along which the wingless fuselage ran to gather speed for the crash. The concrete wall, reinforced with steel, is at the left.

First Public Tests of New "Cam Motor" Successful

BY USE of cams instead of piston rods and a crank shaft, Harry A. Palmer, of Boston, has developed a new airplane motor which promises great development in aviation. This new motor does away with about one-half the working parts of the average engine and thus requires about fifty per cent less weight allowance in a plane.

The photo to the left shows how compact Palmer's new motor can be mounted. Motor head resistance is one of the most difficult problems that is yet to be solved.

Each piston is connected by a lever to the egg-shaped disk shown behind the propeller. The power thrust is transmitted to this disk which revolves in a smooth motion. The cam principle does away with the direct hammering effect of a piston thrust and thus minimizes vibration.

HIGH ALTITUDE HELMET

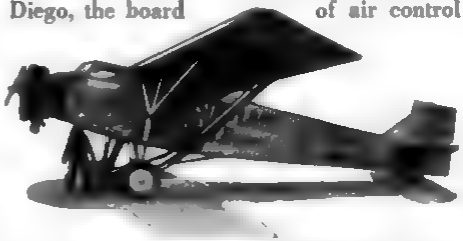
HIGH altitude flying has been made possible by use of oxygen for both men and motors. Lt. J. A. Macready of the Army Air Service is shown below with the latest type helmet.

The entire face is covered, and the glasses are built in the helmet itself. The tube that enters just below the nose furnishes oxygen to the aviator in any amount that he desires. The tanks are controlled by a valve.

Some of the early helmets for this service were very complicated and resembled an ocean diver's top piece. As a consequence of their bulkiness they have given way to this new head piece, which combines both utility of purpose and streamline design.

POLICE TAKE TO AIR

IN ORDER to enforce rules of the air and assure safety for the residents of San Diego, the board of air control



has put into service for police duty a Prudden all-metal monoplane.

Whenever an aviator is flying too low, performing stunts over prohibited areas, or otherwise breaking the air regulations this police plane is dispatched after him. If he can read, he can readily make out the sign, "LAND AT ONCE," which is prominently displayed on the fuselage.

AIR SERVICE GROWS

COMPLETE statistics covering aviation activities in Great Britain during the past year have just been issued by the Air Ministry showing the total number of passengers transported was 90,695. Of this number 16,533 flew across the English Channel.

From 4,075 trips planned, 3,432 were successfully completed without interruption. Of those interrupted, 319 were resumed and completed. This gives a proportion of 84 per cent of the trips successfully completed.

New Aviation School for Youngsters in California

LOS ANGELES youngsters have the opportunity of receiving expert instruction in aviation. The only aviation school for juveniles is located in California. It embraces a 12-week course in theoretical and practical flying.

Construction of motors is conducted under supervision of a faculty staff which includes some of the best known authorities in Southern California.

Three boys with framework of miniature planes are shown in the photo. The strips of wood are cut from a solid board such as the youth in the center is holding. Each tiny piece is fashioned to scale from diagrams and patterns.

GIANT MONOPLANE

TEN MEN are required to budge this huge monoplane a few feet from its hangar. The Bernard plane is one of the largest of this type in the world.

Its spacious interior is equipped in a palatial style. Passengers may be at complete ease even in a bad storm. A reading room and all modern facilities are a part of the equipment, and the tremendous wing spread affords real safety.

A special gasoline compartment is provided in order that longer flights may be made without the necessary stops for refueling.

RUSH ORDERS BY PLANE

LOADED with a consignment of pens, pencils and desk sets, a Fairchild plane recently arrived at Bowman field, municipal airport, Louisville, Ky., from the factory in Janesville, Wis.

Officials of the company purchased the plane to fill rush orders. It has proved of great value in this capacity. Dealers in all sections of the country are now able to get the fastest possible service on their orders.

Edgar La Parle, with 3,000 hours in the air to his credit, pilots the ship.

Photo shows the Bernard monoplane, equipped with the newest type of Hispano motors.

NEW USES *for old*

This contest is growing more popular each month! Readers of Modern Mechanics are invited to enter by sending in pictures of odd uses to which old Fords have been put, and, as a tribute to the versatility of old Tin Lizzie of fond memory, Modern Mechanics will offer $10 for every photo accepted for publication. Contest runs until further notice—no closing dates, so send in your photo now!

READERS of MODERN MECHANICS have sent us an unusually diversified assortment of photographs for publication this month. The four which were selected were chosen because of their practicability as well as their novelty.

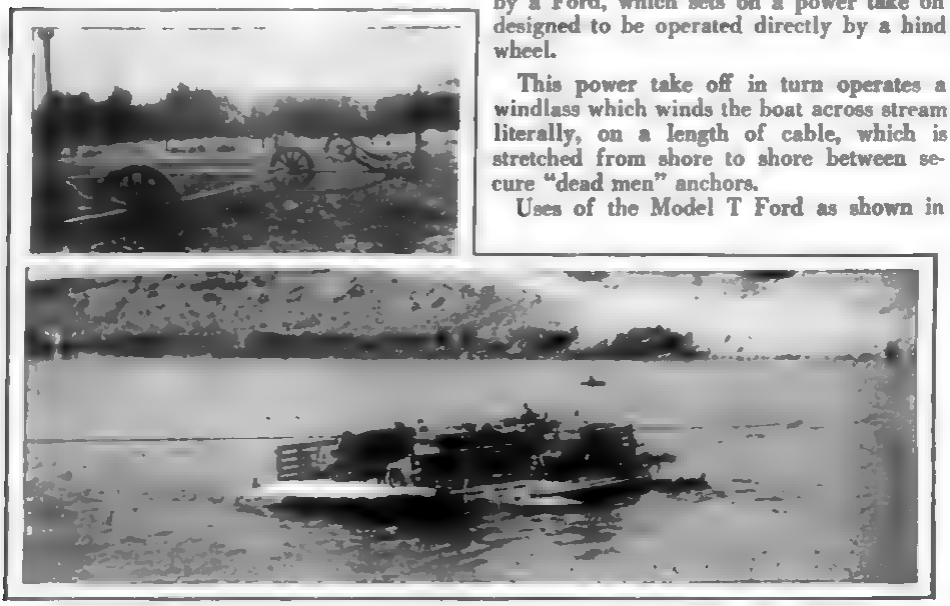
Among the most unusual is one contributed by G. H. Dacy, of Baltimore, Md. This use, shown in the photo immediately below, makes use of nothing but the wheels of an old Ford. Pipes for the conduction of water are mounted through the hubs of the wheels. The pipes are drilled so that water under pressure can escape in a fine series of streams. The whole makes a sprinkler which will water the most expansive lawn with little effort.

Somewhere in Nebraska, from a contributor who neglected to mention the name of the river, an odd ferry is in operation. The queer contraption consists of a catamaran-like hull on which a platform has been thrown. The boat travels sideways. In other words, the hulls are up and down stream, to better cut the swift current, and the boat moves from one side of the stream to the other, in the direction in which the platform is placed.

Motive power for this ferry is furnished by a Ford, which sets on a power take off designed to be operated directly by a hind wheel.

This power take off in turn operates a windlass which winds the boat across stream literally, on a length of cable, which is stretched from shore to shore between secure "dead men" anchors.

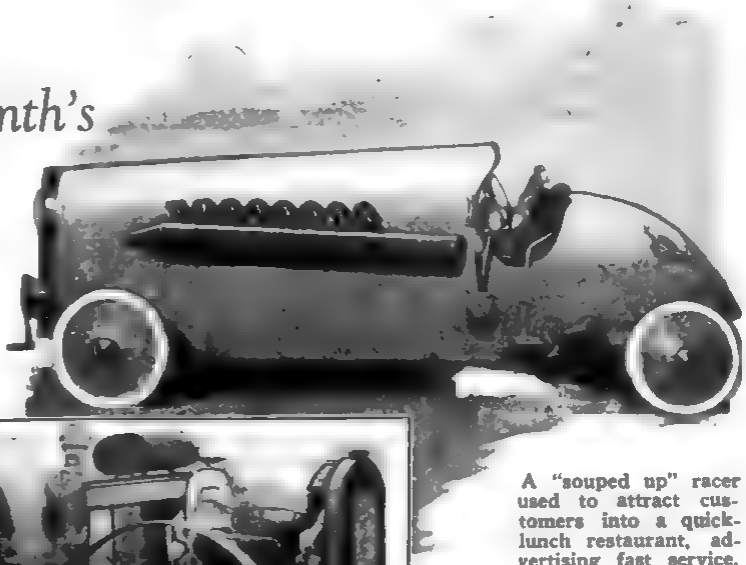
Uses of the Model T Ford as shown in



The wheels of old Fords have been used by a Georgia golf club in making a traveling lawn sprinkler. Below, a ferry shown being driven by an old Tin Betsy installed on a power take off.

Fords CONTEST

This Month's Prize Winners



A "souped up" racer used to attract customers into a quick-lunch restaurant, advertising fast service.

"Daown in Arkansaw" this saw was made from an old Ford plant, and cuts cordwood every day. Mounted on the wheels of an old rake, in wheel barrow fashion, the saw carriage is easily accessible.

the picture depicting sawing operations are numerous. Contributions to the contest have been returned where the saw adaptation has been used, as have all other uses which are not new to the editors. However, photographic evidence of a Ford actually sawing wood, though the use was mentioned in the November issue of the magazine, was thought to be of interest and the editors awarded the prize to an Arkansas reader some months ago, holding the photo for publication this month. The particular novelty which was responsible for this particular application of the sawing use being awarded a prize was the obviously improvised carriage, mounting and radiator. This tends to show that a Ford engine only needs a place to run and someone to turn the crank to get goin'! Uses to which the Ford has been put should be different from any that have been published in the magazine to be of any value to the editors of MODERN MECHANICS.

Most of the new uses in MODERN MECHANICS contest have shown the Fords sturdily laboring at hard tasks. The use which was contributed by Herbert Photos, Inc., shows an old Ford chassis doing work as an advertising sign in front of one of California's queer shops. The car was endowed with a special racing body, placed on the lawn in front of the shop, which was a quick, quick-lunch place, and served to impress customers they would be waited on with racing car speed. During the rush hours, the motor would be kept running with cut-out open, and an attendant in the form of a monkey, shown in the photo, played the part of race driver.

CARTER of the Red

From the distant planet Earth, John Carter, the Virginian, came to Mars to battle with Green Warriors in his peril-fraught effort to breathe new life into a dying world. Begin this great serial now; a summary of previous chapters is printed as part of the story.

OF THE incredible manifestation of nature which took me, John Carter of Virginia, and wafted me across countless miles of space to the planet Mars, I think I need say little. In the first place, I cannot myself explain how my soul was drawn irresistibly toward the red planet on that night, years ago, when I stood mysteriously alone on an Arizona hill; nor does it really matter how the miracle of my transmigration was accomplished.

What *does* matter is that I suddenly awakened to find myself lying on a moss-covered bed which I knew instinctively was on the planet Mars. I had been lying alongside a queer building, with walls about five feet high, covered by a glass roof. Examining the structure, I discovered that it was filled with thousands of eggs about six feet long; several of them had hatched into queer, scrawny little beings

Suddenly I felt the sharp point of his spear at my breast . . . all went black before me; my head whirled in dizziness and my knees gave way.

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PLANET by EDGAR RICE BURROUGHS

A Novel of Extraordinary Adventure on the Red Planet Mars

with huge heads, grotesque ears and goggle-like eyes—and two sets of arms!

While I was examining these monstrosities, I was captured by a detachment of Martians similar in every respect to the youngsters just hatched, except that they averaged twelve feet in height, and had skins of dark green hue. They held me a prisoner in a ruined city which they occupied, a city which gave evidence of dating back to remote antiquity. Obviously it had been constructed by some other people than the green men, for the walls were covered with pictures representing a fair-skinned people very like human beings.

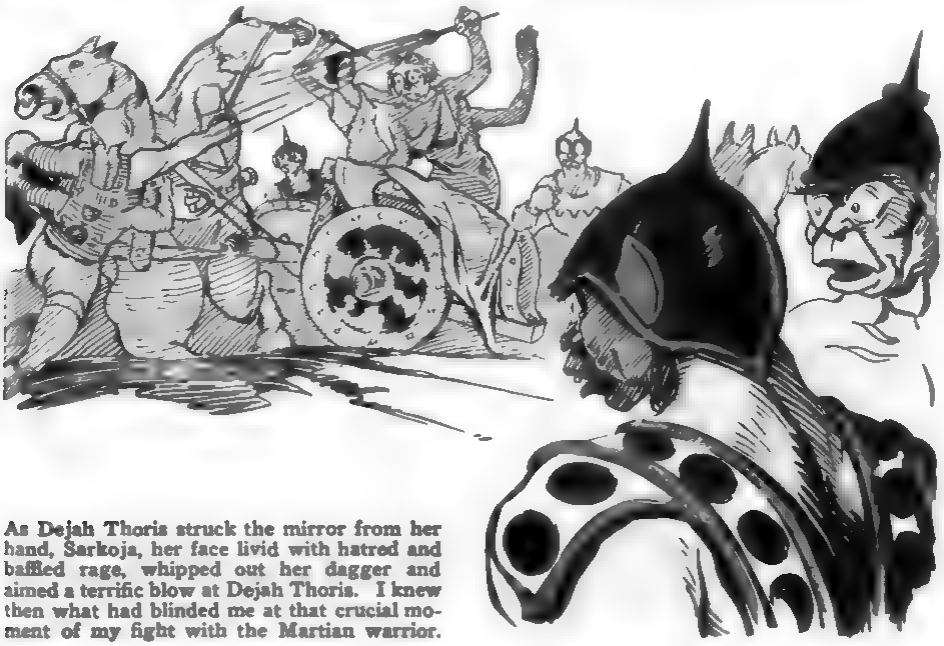
I had been held captive for perhaps a month when the green Martians suddenly came swarming into the buildings of the city one day, pointing their powerful radium rifles at a score of balloon-like objects which came floating to the city over the horizon. When the airships came within range, the Martians discharged their guns into the center of the approaching fleet, frightened away all except one ship, which was crippled so badly that it fell to the ground a short distance away.

The Martians went out to examine this ship, and presently returned to the city with a prisoner in their midst. Judge of my amazement when I saw that the prisoner was a woman as beautiful and as perfectly formed as any of her sisters on Earth!

Making Friends With Woola

I DID not see the prisoner again for several days subsequent to our first encounter, and then only to catch a fleeting glimpse of her as she was being conducted to the great audience chamber where I had had my first meeting with Lorquas Ptomel. I could not but note the unnecessary harshness and brutality with which her guards treated her.

I had observed on the two occasions when I had seen her that the prisoner exchanged words with her guards, and this convinced me that they spoke, or at least could make themselves understood by a common language. With this added incentive I nearly



As Dejah Thoris struck the mirror from her hand, Sarkoja, her face livid with hatred and baffled rage, whipped out her dagger and aimed a terrific blow at Dejah Thoris. I knew then what had blinded me at that crucial moment of my fight with the Martian warrior.

drove Sola distracted by my importunities to hasten on my education, and within a few more days I had mastered the Martian tongue sufficiently well to enable me to carry on a passable conversation and to fully understand practically all that I heard.

In advising me that I must not leave the boundaries of the city Sola had explained that Woola would prevent this anyway should I attempt it, and she warned me most urgently not to arouse his fierce nature by ignoring his warnings should I venture too close to the forbidden territory. His nature was such, she said, that he would bring me back into the city dead or alive should I persist in opposing him; "preferably dead," she added.

On this morning I had chosen a new street to explore when suddenly I found myself at the limits of the city. Before me were low hills pierced by narrow and inviting ravines. I longed to explore the country before me, and, like the pioneer stock from which I sprang, to view what the landscape beyond the encircling hills might disclose from the summits which shut out my view.

It also occurred to me that this would prove an excellent opportunity to test the qualities of Woola. I was convinced that the brute loved me; I had seen more evidence of affection in him than in any other Martian animal, man or beast, and I was sure that gratitude for the acts that had twice saved his life would more than outweigh his loyalty to the duty imposed upon him by cruel and loveless masters.

Exploration

AS I approached the boundary line Woola ran anxiously before me, and thrust his body against my legs. His expression was pleading rather than ferocious, nor did he bare his great tusks or utter his fearful guttural warnings.

I had never petted nor fondled him, but now I sat upon the ground and putting my arms around his heavy neck I stroked and coaxed him, talking in my newly acquired Martian tongue as I would have to my hound at home, as I would have talked to any other friend among the lower animals. His response to my manifestation of affection was remarkable to a degree; he stretched his great mouth to its full width, baring the entire expanse of his upper rows of tusks and wrinkling his snout until his great eyes were almost hidden by the folds of flesh. If you have ever seen a collie smile you may have some idea of Woola's facial distortion.

He threw himself upon his back and fairly wallowed at my feet; jumped up and sprang upon me, rolling me upon the ground by his great weight; then wriggling and squirming around me like a playful puppy presenting its back for the petting it craves.

There was no further question of authority between us; Woola was my devoted slave from that moment hence, and I his only undisputed master. My walk to the hills occupied but a few minutes, and I found nothing of particular interest to reward me. Numerous brilliantly colored and strangely formed wild flowers dotted the ravines and from the summit of the first hill I saw still other hills stretching off toward the north, and rising, one range above another, until lost in mountains of quite respectable dimensions; though I afterward found that only a few peaks on all Mars exceed four thousand feet in height; the suggestion of magnitude was merely relative.

My morning's walk had been large with importance to me for it had resulted in a perfect understanding with Woola, upon whom Tars Tarkas relied for my safe keeping. I now knew that while theoretically a prisoner I was virtually free, and I hastened to regain the city limits before the defection of Woola could be discovered by his erstwhile masters. The adventure decided me never again to leave the limits of my prescribed stamping grounds until I was ready to venture forth for good and all, as it would certainly result in a curtailment of my liberties, as well as the probable death of Woola, were we to be discovered.

The Human Captive

ON REGAININIG the plaza I had my third glimpse of the captive girl. She was standing with her guards before the entrance to the audience chamber, and as I approached she gave me one haughty glance and turned her back full upon me. The act was so womanly, so earthly womanly, that though it stung my pride it also warmed my heart with a feeling of companionship; it was good to know that some one else on Mars beside myself had human instincts of a civilized order, even though the manifestation of them was so painful and mortifying.

Seeing that the prisoner seemed the center of attraction I halted to view the pro-

ceedings. I had not long to wait for presently Lorquas Ptomel and his retinue of chieftains approached the building and, signing the guards to follow with the prisoner, entered the audience chamber. Realizing that I was a somewhat favored character, and also convinced that the warriors did not know of my proficiency in their language, as I had plead with Sola to keep this a secret on the grounds that I did not wish to be forced to talk with the men until I had perfectly mastered the Martian tongue, I chanced an attempt to enter the audience chamber and listen to the proceedings.

The council squatted upon the steps of the rostrum, while below them stood the prisoner and her two guards. One of the women was named Sarkoja. Her attitude toward the captive was most harsh and brutal. When she held her, she sunk her rudimentary nails into the poor girl's flesh, or twisted her arm in a most painful manner.

The other woman was less cruel because she was entirely indifferent; if the prisoner had been left to her alone, and fortunately she was at night, she would have received no harsh treatment, nor, by the same token would she have received any attention at all.

As Lorquas Ptomel raised his eyes to address the prisoner they fell on me and he turned to Tars Tarkas with a word, and gesture of impatience. Tars Tarkas made some reply which I could not catch, but which caused Lorquas Ptomel to smile; after which they paid no further attention to me.

"What is your name?" asked Lorquas Ptomel, addressing the prisoner.

"Dejah Thoris, daughter of Mors Kajak of Helium."

"And the nature of your expedition?" he continued.

"It was a purely scientific research party sent out by my father's father, the Jeddak of Helium, to rechart the air currents, and to take atmospheric density tests," replied the fair prisoner, in a low, well modulated voice.

"We were unprepared for battle," she continued, "as we were on a peaceful mission, as our banners and the colors of our craft denoted. The work we were doing was as much in your interests as in ours, for you know full well that were it not for our labors and the fruits of our scientific operations there would not be enough air or water on Mars to support a single human life. For ages we have maintained the air and water supply at practically the same point without an appreciable loss, and we have done this in the face of the brutal and ignorant interference of you green men.

"Why, oh, why will you not learn to live in amity with your fellows, must you ever go on down the ages to your final extinction but little above the plane of the dumb brutes that serve you! Come back to the ways of our common ancestors, come back to the light of kindliness and fellowship. The way is open to you, you will find the hands of the red men stretched out to aid you. Together we may do still more to regenerate our dying planet. The granddaughter of the greatest and mightiest of the red jeddaks has asked you. Will you come?"

The Captive Attacked

LORQUAS PTOMEL and the warriors sat looking silently and intently at the young woman for several moments after she had ceased speaking. What was passing in their minds no man may know, but that they were moved I truly believe.

I saw Tars Tarkas rise to speak, and on his face was such an expression as I had never seen upon the countenance of a green Martian warrior. It bespoke an inward and mighty battle with self, with heredity, with age-old custom, and as he opened his mouth to speak, a look almost of benignity, of kindliness, momentarily lighted up his fierce and terrible countenance.

What words of moment were to have fallen from his lips were never spoken, as just then a young warrior, evidently sensing the trend of thought among the older men, leaped down from the steps of the rostrum, and striking the frail captive a powerful blow across the face, which felled her to the floor, placed his foot upon her prostrate form and turning toward the assembled council broke into peals of horrid, mirthless laughter.

For an instant I thought Tars Tarkas would strike him dead, nor did the aspect of Lorquas Ptomel augur any too favorably for the brute, but the mood passed, their old selves reasserted their ascendency, and they smiled.

That I have taken moments to write down a part of what occurred as that blow fell does not signify that I remained inactive for any such length of time. Scarcely had his hideous laugh rang out but once, when I was upon him. The brute was twelve feet

in height and armed to the teeth, but I believe that I could have accounted for the whole roomful in the terrific intensity of my rage. Springing upward, I struck him full in the face as he turned at my warning cry and then as he drew his short-sword I drew mine and sprang up again upon his breast, hooking one leg over the butt of his pistol while I delivered blow after blow upon his enormous chest.

He could not use his short-sword to advantage because I was too close to him, nor could he draw his pistol, which he attempted to do in direct opposition to Martian custom which says that you may not fight a fellow warrior in private combat with any other than the weapon with which you are attacked. In fact he could do nothing but make a wild and futile attempt to dislodge me. With all his immense bulk he was little if any stronger than I, and it was but the matter of a moment or two before he sank, bleeding and lifeless, to the floor.

Dejah Thoris had raised herself upon one elbow and was watching the battle with wide, staring eyes. When I had regained my feet I raised her in my arms and bore her to one of the benches at the side of the room.

Again no Martian interfered with me, and tearing a piece of silk from my cape I endeavored to staunch the flow of blood from her nostrils. I was soon successful as her injuries amounted to little more than an ordinary nosebleed, and when she could speak she placed her hand upon my arm and looking up into my eyes, said:

"Why did you it? You who refused me even friendly recognition in the first hour of my peril! And now you risk your life and kill one of your companions for my sake. I cannot understand. What strange manner of man are you, that you consort with the green men, though your form is that of my race, while your color is little darker than that of the white ape? Tell me, are you human, or are you more than human?"

"It is a strange tale," I replied, "too long to attempt to tell you now, and one which I so much doubt the credibility of myself that I fear to hope that others will believe it. Suffice it, for the present, that I am your friend, and, so far as our captors will permit, your protector and your servant."

"Then you too are a prisoner? But why, then, those arms and the regalia of a Tharkian chieftain? What is your name? Where your country?"

"Yes, Dejah Thoris, I too am a prisoner; my name is John Carter, and I claim Virginia, one of the United States of America Earth, as my home; but why I am permitted to wear arms I do not know, nor was I aware that my regalia was that of a chieftain."

A Warrior of Mars

WE WERE interrupted at this juncture by the approach of one of the warriors, bearing arms, accouterments and ornaments, and in a flash one of her questions was answered and a puzzle cleared up for me. I saw that the body of my dead antagonist had been stripped, and I read in the menacing yet respectful attitude of the warrior who had brought me these trophies of the kill the same demeanor as that evinced by the other who had brought me my original equipment, and now for the first time I realized that my blow, on the occasion of my first battle in the audience chamber had resulted in the death of my adversary.

The reason for the whole attitude displayed toward me was now apparent; I had won my spurs, so to speak, and in the crude justice, which always marks Martian dealings, and which, among other things, has caused me to call her the planet of paradoxes, I was accorded the honors due a conqueror; the trappings and the position of the man I killed.

As I had turned to receive the dead warrior's chattels I had noticed that Tars Tarkas and several others had pushed forward toward us, and the eyes of the former rested upon me in a most quizzical manner. Finally he addressed me:

"You speak the tongue of Barsoom quite readily for one who was deaf and dumb to us a few short days ago. Where did you learn it, John Carter?"

"You, yourself, are responsible, Tars Tarkas," I replied, "in that you furnished me with an instructress of remarkable ability; I have to thank Sola for my learning."

"She has done well," he answered, "but your education in other respects needs considerable polish. Do you know what your unprecedented temerity would have cost you had you failed to kill either of the two chieftains whose metal you now wear?"

"I presume that that one whom I had failed to kill, would have killed me," I answered, smiling.

In breaking the great thoat to my use, I treated him with kindness to such good effect that the Green Warriors were amazed at the beast's docility.

"No, you are wrong. Only in the last extremity of self-defense would a Martian warrior kill a prisoner; we like to save them for other purposes," and his face bespoke possibilities that were not pleasant to dwell upon.

"But one thing can save you now," he continued. "Should you, in recognition of your remarkable valor, ferocity, and prowess, be considered by Tal Hajus as worthy of his service you may be taken into the community and become a full-fledged Tharkian. Until we reach the headquarters of Tal Hajus it is the will of Lorquas Ptomel that you be accorded the respect your acts have earned you. You will be treated by us as a Tharkian chieftain, but you must not forget that every chief who ranks you is responsible for your safe delivery to our mighty and most ferocious ruler. I am done."

I now turned my attention to Dejah Thoris, and assisting her to her feet I turned with her toward the exit, ignoring her hovering guardian harpies as well as the inquiring glances of the chieftains. Was I not now a chieftain also! Well, then, I would assume the responsibilities of one. They did not molest us, and so Dejah Thoris, Princess of Helium, and John Carter, gentleman of Virginia, followed by the faithful Woola, passed through utter silence from the audience chamber of Lorquas Ptomel, Jed among the Tharks of Barsoom.

AS WE reached the open the two female guards who had been detailed to watch over Dejah Thoris hurried up and made as though to assume custody of her once more. The poor child shrank against me and I felt her two little hands fold tightly over my arm. Waving the women away, I informed them that Sola would attend the captive hereafter, and I further warned Sarkoja that any more of her cruel attentions bestowed upon Dejah Thoris would result in Sarkoja's sudden and painful demise.

I soon found Sola and explained to her that I wished her to guard Dejah Thoris as she had guarded me; that I wished her to find other quarters where they would not be molested by Sarkoja, and I finally informed her that I myself would take up my quarters among the men.

I accompanied Sola and Dejah Thoris in a search for new quarters, which we found in a building nearer the audience chamber and of far more pretentious architecture than our former habitation. We also found in this building real sleeping apartments with ancient beds of highly wrought metal swinging from enormous gold chains depending from the marble ceilings. The decoration of the walls was most elaborate, and, unlike the frescoes in the other buildings I had examined, portrayed many human figures in the compositions.

We decided to use this room, on the second floor and overlooking the plaza, for Dejah Thoris and Sola, and another room adjoining and in the rear for the cooking and supplies. I then dispatched Sola to bring the bedding and such food and utensils as she might need, telling her that I would guard Dejah Thoris until her return.

As Sola departed Dejah Thoris turned to me with a faint smile.

"And whereto, then, would your prisoner escape should you leave her, unless it was to follow you and crave your protection, and ask your pardon for the cruel thoughts she has harbored against you these past few days?"

"You are right," I answered, "there is no escape for either of us unless we go together."

"In the name of my first ancestor," she continued, "where may you be from? You are like unto my people, and yet so unlike. You speak my language, and yet I heard you tell Tars Tarkas that you had but learned it recently. All Barsoomians speak the same tongue from the ice-clad south to the ice-clad north, though their written languages differ. Only in the valley Dor, where the river Iss empties into the lost sea of Korus, is there supposed to be a different language spoken, and, except in the legends of our ancestors, there is no record of a Barsoomian returning up the river Iss, from the shores of Korus in the valley of Dor. Do not tell me that you have thus returned! They would kill you horribly anywhere upon the surface of Barsoom if that were true; tell me it is not!"

Her eyes were filled with a strange, weird light; her voice was pleading, and her little hands, reached up upon my breast, were pressed against me as though to wring a denial from my very heart.

"I am of another world," I answered, "the great planet Earth, which revolves about our common sun and next within the orbit of your Barsoom, which we know as Mars. How I came here I cannot tell you, for I do not know; but here I am, and since my presence has permitted me to serve Dejah Thoris I am glad that I am here."

The Man From Earth

SHE gazed at me with troubled eyes, long and questioningly. That it was difficult to believe my statement I well know, nor could I hope that she would do so however much I craved her confidence and respect. I would much rather not have told her anything of my antecedents, but no man could look into the depth of those eyes and refuse her slightest behest.

Finally she smiled, and, rising, said: "I shall have to believe even though I cannot understand. I can readily perceive that you are not of the Barsoom of today; you are like us, yet different—but why should I trouble my poor head with such a problem, when my heart tells me that I believe because I wish to believe!"

I then narrated the details of my departure from the Earth, explaining that my body there lay fully clothed in all the, to her, strange garments of mundane dwellers. At this point Sola returned with our meager belongings and her young Martian protege, who, of course, would have to share the quarters with them.

Sola asked us if we had had a visitor during her absence, and seemed much surprised when we answered in the negative. It seemed that as she had mounted the approach to the upper floors where our quarters were located, she had met Sarkoja descending.

We decided that she must have been eavesdropping, but as we could recall nothing of importance that had passed between us we dismissed the matter as of little consequence, merely promising ourselves to be warned to the utmost caution in the future.

Dejah Thoris and I then fell to examining the architecture and decorations of the beautiful chambers of the building we were occupying. She told me that these people had presumably flourished over a hundred thousand years before. They were the early progenitors of her race, but had mixed with the other great race of early Martians, who were very dark, almost black, and also with the reddish yellow race which had flourished at the same time.

We had been so engrossed in exploration of the building and in our conversation that it was late in the afternoon before we realized it. We were brought back to a realization of our present conditions by a messenger bearing a summons from Lorquas Ptomel directing me to appear before him forthwith. Bidding Dejah Thoris and Sola farewell, and commanding Woola to remain on guard, I hastened to the audience chamber, where I found Lorquas Ptomel and Tars Tarkas seated upon the rostrum.

Plans for Escape

AS I entered and saluted, Lorquas Ptomel signaled me to advance, and, fixing his great, hideous eyes upon me, addressed me thus:

"You have been with us a few days, yet during that time you have by your prowess won a high position among us. Be that as it may, you are not one of us; you owe us no allegiance.

"Your position is a peculiar one," he continued; "you are a prisoner and yet you give commands which must be obeyed; you are an alien and yet you are a Tharkin chieftain; you are a midget and yet you can kill a mighty warrior with one blow of your fist. And now you are reported to have been plotting to escape with another prisoner of another race; a prisoner who, from her own admission, half believes you are returned from the valley of Dor. Either one of these accusations, if proved, would be sufficient grounds for your executions, but we are a just people and you shall have a trial on our return to Thark, if Tal Hajus so commands."

Turning, I left the audience chamber. So this was the beginning of Sarkoja's persecution! I knew that none other could be responsible for this report which had reached the ears of Lorquas Ptomel so quickly, and now I recalled those portions of our conversation which had touched upon escape and upon my origin.

However, instead of putting thoughts of possible escape from my mind, my audience with Lorquas Ptomel only served to center my every faculty on this subject. Now, more than before, the absolute necessity for escape, in so far as Dejah Thoris was concerned, was impressed upon me, for I was convinced that some horrible fate awaited her at the headquarters of Tal Hajus.

As described by Sola, this monster was the exaggerated personification of all the ages of cruelty, ferocity, and brutality from which he had descended. Cold, cunning, calculating; he was, also, in marked contrast to most of his fellows, a slave to that brute passion which the waning demands for procreation upon their dying planet has almost stilled in the Martian breast.

As I wandered about the plaza lost in my gloomy forebodings Tars Tarkas approached me on his way from the audience chamber. His demeanor toward me was unchanged, and he greeted me as though we had not just parted a few moments before.

"Where are your quarters, John Carter?" he asked.

"I have selected none," I replied. "It seemed best that I be quartered either by myself or among the other warriors, and I was awaiting an opportunity to ask your advice. As you know," and I smiled, "I am not yet familiar with all the customs of the Tharks."

"Come with me," he directed, and together we moved off across the plaza to a building which I was glad to see adjoined that occupied by Sola and her charges.

I finally chose a front room on the third floor, because this brought me nearer to Dejah Thoris, whose apartment was on the second floor of the adjoining building, and it flashed upon me that I could rig up some means of communication whereby she might signal me in case she needed either my services or my protection.

The March to War

FOLLOWING the battle with the air ships, the community remained within the city for several days, abandoning the homeward march until they could feel rea-

(Continued on Page 166)

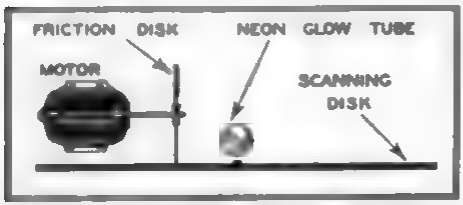
Edited by CHARLES MAGEE ADAMS

Television is rapidly becoming almost as important a feature of radio as the broadcasting of sound programs. In his department this month, Mr. Adams tells how to make a simple set which will receive the silhouette movies now being broadcast by C. Francis Jenkins of Washington, D. C.

Adapt Your Set to Receive Jenkins Radio Movies

RADIO movies are being broadcast by the Jenkins station, W3XK, at Washington, D. C., on 46.7 meters (6420 k. c.), 48 horizontal lines per picture, beginning at the top, and 15 pictures per second. These signals are reported as getting out well and being reproduced in many parts of the country. Awaiting the time when home televisers or practical television receivers are available for the laity, C. Francis Jenkins, the inventor of the system, offers some suggestions which should prove of value to experimenters.

If you have a 12-inch scanning disk and a motor available (a 1725 r. p. m. induction or d. c. motor of from 1/20 to 1/8 h. p.) may I suggest a simple means of securing the speed control necessary for the steadiest and clearest radio movies. Cut from the rubber inner tube of an automobile tire a disc about 2½ to 3 inches in diameter, and place this between 2-inch diameter washers or flanges on a hub that will fit the shaft of the motor. Mount this motor on a board which can slide between guide strips on the platform or table in such a way that the rubber disc bears at right angles against the back of the scanning disk about three inches from the scanning disk center.



This top view of the television receiver shows how the motor propels the scanning disk. A circle of rubber between two metal washers is used to make the propelling friction disk.

Such a friction drive is most satisfactory in obtaining and maintaining the necessary driving speed. To use it, tune in station W3XK on a short wave receiver or short wave adapter and adjust the speed of the scanning disk to 900 r. p. m. by sliding the supporting board holding the motor in or out from the scanning disk center until the picture comes in, as you look through the top of the disk at the glowing neon lamp. It is astonishingly easy to get synchronism by this method, and the layout is very simple.

Don't use more than two rubber disks together, cut from the average thickness of inner tubing, and one thickness is usually best. The disk may chatter a little at starting, but the synchronism is easily held after it is up to speed.

The neon glow tube should be connected to the output of the amplifier of the set. A good B power unit or B batteries may be employed. It is well to use a switch so that

the output can be thrown from the neon lamp to the loudspeaker in order to receive either television signals or the voice announcements between pictures. The glowing electrode (cathode) of the neon lamp should, of course, face the disk. If it does not, the connections may be reversed.

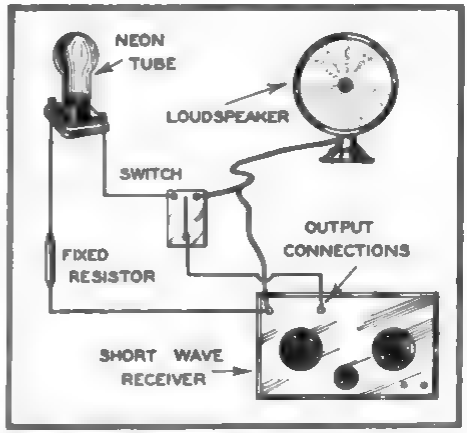
While this simple arrangement will get pictures when attached to any good radio set, much better results are obtained if a resistance-coupled amplifier is used.

A word about operating the receiver. For best results, the set must be adjusted to the point of non-oscillation or just below the point where oscillations begin. In other words, a receiver that will bring in good phone reception will produce good pictures.

The image received should be in black; that is, the lamp is continuously lighted until picture signals blink it out to make up the movies in black silhouette on a pink background.

The amount of light given off is regulated by the C bias on the last or power tube of the amplifier, although the bias must be high enough to permit the incoming picture signals to overcome the plate current, blocking the light given off by the neon lamp. It has been found that a C bias voltage between 12 and 45 on the last tube will be sufficient on all types of neon glow tubes.

To receive pictures, tune in on station W3XK and listen for the announcements. The signals are broadcast on 46.7 meters for an hour every Monday, Wednesday and Friday evening at 8 o'clock, E. S. T. At



This diagram illustrates the method of switching from the neon lamp to the loudspeaker. Battery connections to the short wave receiver are not shown, as they follow standard practice. The fixed resistor in series with the neon lamp should be of from 5,000 to 10,000 ohms.

first there will be only black and pink dots in the picture area, but when the speed of the scanning disk has been brought into synchronism with the speed of the transmitter the picture will suddenly appear, as one looks at the neon lamp through the flying holes of the disk. When the transmission of the picture ends, the picture frame on the scanning disk is smooth pink and you should switch to the loudspeaker to listen to the announcer.

If the picture appears up-side-down, take off the disk and turn it around, other side out. This will bring the image right-side-up.

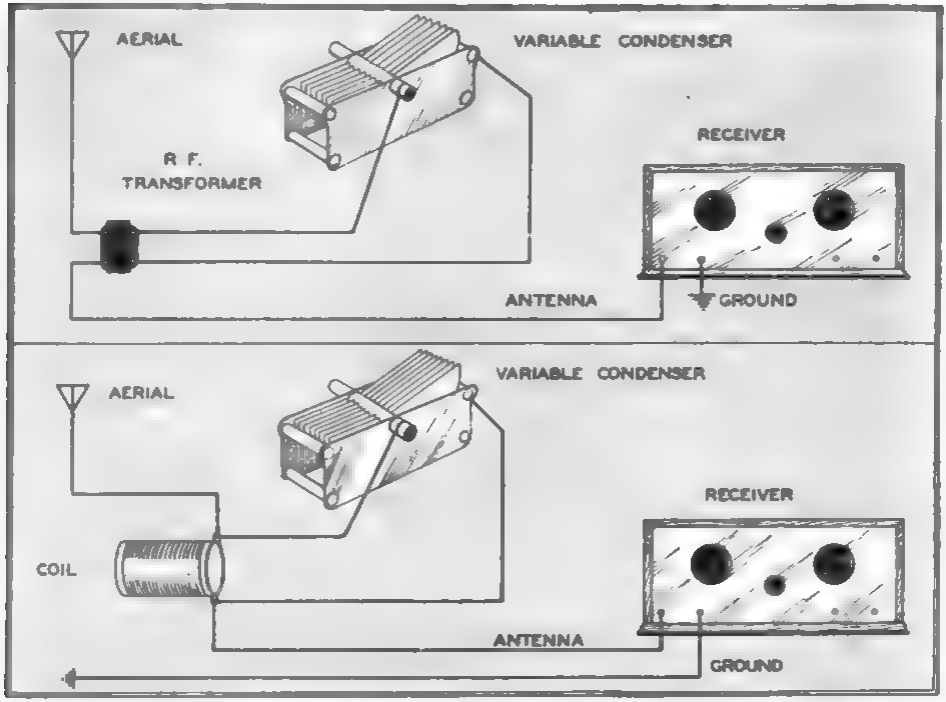
MAKING RADIO SAFE FOR THE LIVING ROOM

SINCE the power supply is brought to the modern receiver through an a. c. cord or battery cable the chief problem remaining to make radio safe for the living room from an appearance standpoint is taking care of the aerial and ground leads. The women members of a family somehow underestimate the decorative value of wires carried under a window sash or through porcelain bushings set in a wall. But aerial and ground leads there must be, and a way out of this vexing predicament is offered now in radio convenience outlets.

These consist of a metal plate similar in appearance to a standard electrical convenience outlet and carrying terminals of the tip jack type built into a removable rear member. The aerial and ground leads are brought through holes in sash or wall to connecting lugs on this rear member and connection is made to the receiver by flexible cords and plugs. Thus the job can be made as sightly as the household electrical outlet.

For those who wish all radio connections centralized in a single outlet types are available which include with aerial and ground jacks a receptacle for the 110-volt supply, battery cable terminal, or speaker jack. So the ladies—God bless 'em—can now have their radio free from festooning wires and objectionable gadgets.

Home-Made Wavetrap Helps in Tuning Out Undesired Stations



The two types of wavetraps shown in the above diagram will be found helpful in tuning out nearby stations so that distant broadcasts may be received. In the case of fairly distant stations of not too great power, the first hook-up will be satisfactory. When the station is powerful and near by, the lower arrangement is recommended as being of great effectiveness.

A WAVETRAP offers a simple, inexpensive, and effective solution of the difficulties experienced by those fans who live near broadcasting stations and whose receivers are not sufficiently selective to tune out the powerful signal of the nearby transmitter. Either of two types may be used, depending on the power and proximity of the station.

If the station is of medium power and not too close the type shown in the top half of the above drawing is satisfactory. The parts required are one radio frequency transformer (such as the Benjamin Lekeless), one variable condenser of the proper capacity to tune this transformer, two binding posts, and a dial. The circuit and connections to the receiver are shown.

The second type, shown in the lower section of the drawing, is recommended where the interfering station is of high power or very near by. The parts required are a suitable coil, a condenser to match, dial, and two binding posts. If a radio frequency transformer is available its secondary may be used as the coil. Otherwise, a coil can be made by winding 45 turns of No. 22 d. c. c. wire on a three-inch form, if a .0005 mfd. condenser, or 60 turns if a .00035 mfd. condenser is used.

For a permanent installation the equipment can be housed in a small box finished to match the receiver cabinet and placed alongside the latter.

To operate, tune both the receiver and the wavetrap to the undesired station. The wavetrap is then left in this adjustment, and the receiver tuned as usual, when it will be found that the interference is materially reduced. Some loss of volume will be noted on stations whose frequency is near that of the station being tuned out, and the selectivity of the whole is not equal to that of a high-grade receiver. But the improvement will make the small cost quite worth while.

A Railroad for Your Attic

A veteran enthusiast in the building of model railroads is Hugh Boutell of Washington, D. C., an engineer in the employ of the government Bureau of Standards whose hobby is the construction of toy railway systems which occupy the attic of his home. The above photo shows a corner of his attic in which a complete railroad and a model town have been erected. In the circle, Mr. Boutell is putting the finishing touches on one of his tiny locomotives.

Here the model train stops on the bridge to permit its passengers to descend at the Boutelltown station. Note the cardboard houses, water tower, and the safety arms at the crossing.

Complete ALCO SPORTPLANE PLANS

By JOHN M. ALLISON, A.E.

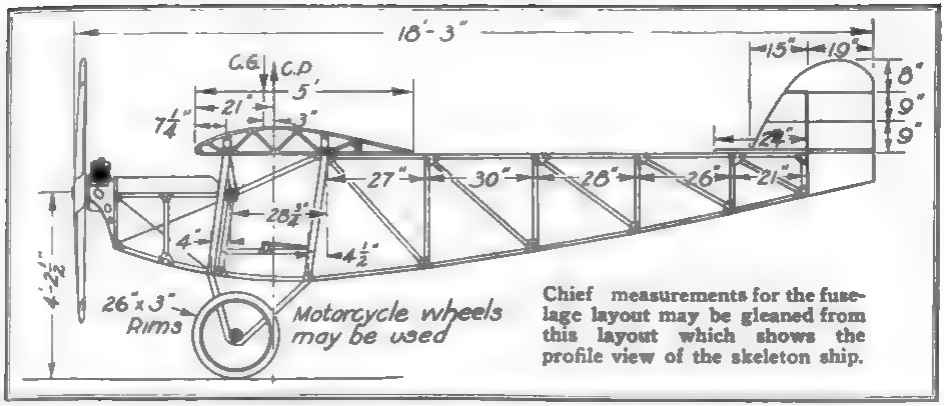
The author, who is an aeronautical engineer, here launches a splendidly detailed, complete article on the construction of the little sport monoplane pictured above. Wing details are covered in this installment.

FOR THE last nine years, or since 1920, the Allison Airplane Co., at Lawrence, Kan., has been marketing plans and blueprints, and selling knockdown parts for a small sport monoplane carrying one or two people with less than 65 horsepower.

Hundreds of amateur builders have made and flown the little ship successfully, using the most ordinary tools for doing the work. These ambitious young men, with typical Yankee ingenuity, have set up their workshop in the parlor, cellar, or barn, and there they have built their rib jigs, made ribs, and the many other items involved before the assembly of the complete plane. Later the complete plane was test flown from some pasture or other small field, by the owner-pilot.

The Alco is a true "flivver" plane, designed especially for the man who wants to fly a plane of his own without investing several thousand dollars in a commercial plane that he would probably "crack up" and damage before he was scarcely capable of handling a plane with any degree of confidence in the air.

The Alco costs only $100 to build, without the motor, and repairs are cheap because they can be made by the builder-flyer, himself. He saves himself hundreds of dollars by using his plane to pile up flying time that is required by the United



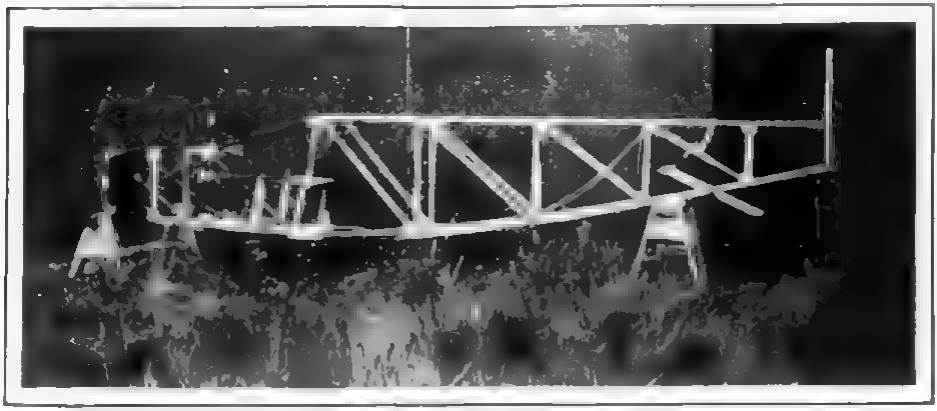
Chief measurements for the fuselage layout may be gleaned from this layout which shows the profile view of the skeleton ship.

States Department of Commerce before issuing a pilot's license. Some of the more daring men have actually taught themselves to fly by the time-honored method used by the pioneers in this country about 1910; this system consists of first "taxiing" around on the field until they could handle the plane nicely on the ground; then short straight-a-way flights of a few feet while the plane is just barely off the ground; then making longer flights at a higher altitude, as skill and confidence are required, until finally they found themselves banking, zooming, and performing all the other feats that are commonplace in the lives of experienced aviators.

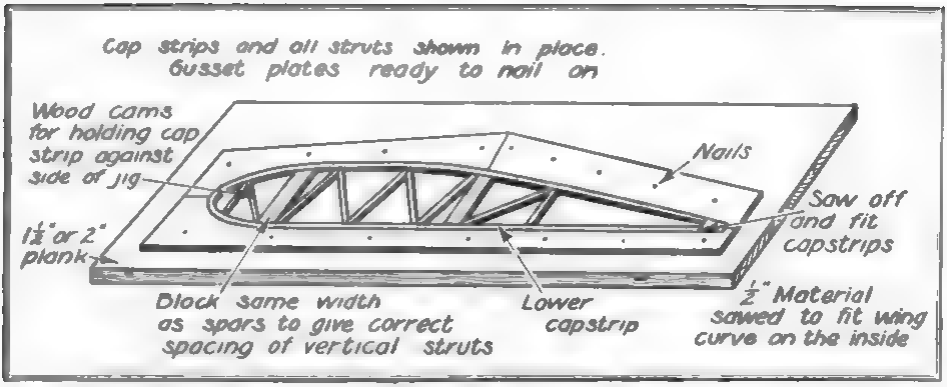
Perhaps after the beginner has built his plane with a motorcycle motor, and successfully flown it, he will feel the urge for more power and range. He will then replace his motorcycle engine which he probably obtained at a junk yard or motorcycle shop for about $15, with a slightly more powerful and expensive engine, say the Lawrence two cylinder opposed 28 horsepower air cooled engine which sells new for about $100 at the present time. The new engine makes the plane capable of greater range and better performance.

So it goes, until the young pilot is absolutely at home in the air, and can fly any type of plane without difficulty.

The history, as given above, is in fact the history of the designer of this plane. The writer taught himself to fly in 1922 in a small plane of his own design. While a student in mechanical engineering at the University of Kansas, he wrote several papers on aeronautical subjects, which are frequently referred to by those interested in aviation. Since his graduation from college, the writer has been associated with his brother in manufacturing high lift replacement wings for war pro-

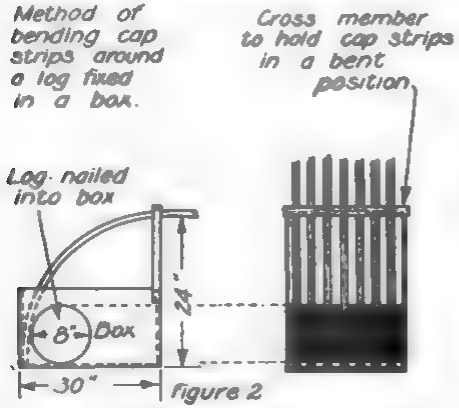


In this view of the fuselage, you will note the use of wood members tied together with the gusset plates, just as members of a bridge are held together. This is a simple strong form of construction, and safe.



This will give you an idea of the method by which wing ribs are made. The jig is made of wood and saves many an hour in the building up of the trussed wing ribs. One half inch material is sawed and laid on plank to serve as template. See trussed rib plan.

duction ships, and small sportplanes which are sold for the most part in knockdown form; that is, without motor, and covering. The knockdown plane consists of all parts such as ribs, spars, fuselage struts, etc., ready to assemble into the complete sportplane. By buying these parts, instead of the complete plane, ready to fly away, the purchaser saves himself a good percentage of the first cost of his plane. Some customers prefer to build their plane up from the raw material, (spruce, cloth, dope, sheet metal, etc.), using the blueprints as a guide for getting the correct proportions and dimensions.



In a smoothed log placed in a box such as shown, the cap strips for the wing ribs are placed and bent. The cross member which holds the ribs while the steam dries out may be made of a piece of strap iron, held by screws.

The writer estimates that he has sold over three thousand sets of plans in the last few years, and he has yet to hear of anyone who built one of the planes which failed to fly. For the benefit of the readers of MODERN MECHANICS, the writer will start telling in simple language how to construct the Alco Sport Monoplane.

Below are the specifications, (Motorcycle engine):

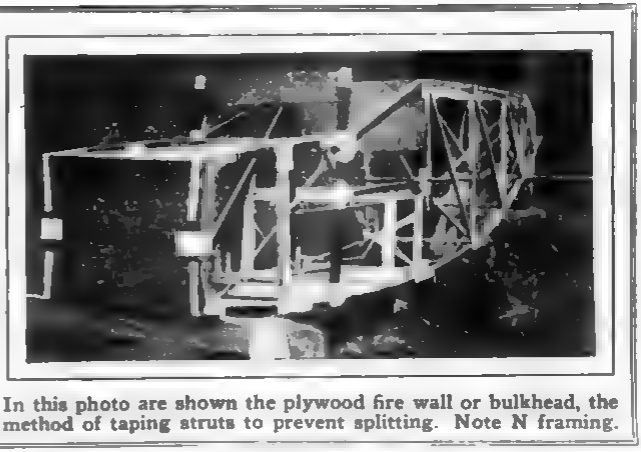
Length over all	18 ft. 3 in.
Weight empty	375 lbs.
High speed	75 M. P. H.
Low speed	30 M. P. H.
Landing speed	30 M. P. H.
Wing span	26 ft.
Wing chord	5 ft.
Gas consumption	1¾ gal. per hr.
Cruising range, (with ten gal. tank,)	400 m.

The first installment of this article will take up the building of the wing. The Gottingen 365 aerofoil is used. This section has proved very successful on several transoceanic flights; the blueprints show a half size drawing. However, if you want to lay out the rib directly without doubling the scale shown in the drawing, the following table of ordinates will be found useful:

%	Upper	Lower
0	1.26	1.26
1¼	3.42	.05
2½	4.74	.00
5	6.58	.00
7½	7.89	.00
10	8.95	.00
15	10.22	.00
20	11.00	.00
30	11.58	.00
40	11.58	.00

%	Upper	Lower
50	10.79	.00
60	9.47	.00
70	7.47	.00
80	5.26	.00
90	2.89	.00
95	1.58	.00
100	.26	.00

The first column is per cent of the wing chord and the chord in this case may be measured along the lower side of the aerofoil since it is perfectly flat except at the nose. The other two columns are plotted against the chord to get the aerofoil drawing for unity chord. For five foot chord plottings all you would have to do would be to multiply the upper and lower aerofoil readings by .60. Five feet is equal to 60 inches, and unity chord may be called 100 inches. 60/100 is equal to .60. The above figures are taken from Report No. 124, published by the National Advisory Committee for Aeronautics, and may be obtained free from the Washington, D. C., headquarters by anyone interested in designing. The figures are not needed in building the Alco Sport Plane, since the figures for the half size rib may be doubled to get the full size curve; they are given merely to show the young designer the line of attack in designing and making a rib jig.



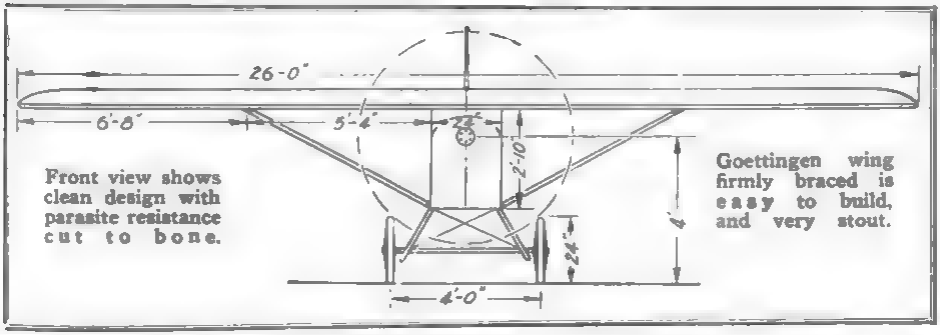
In this photo are shown the plywood fire wall or bulkhead, the method of taping struts to prevent splitting. Note N framing.

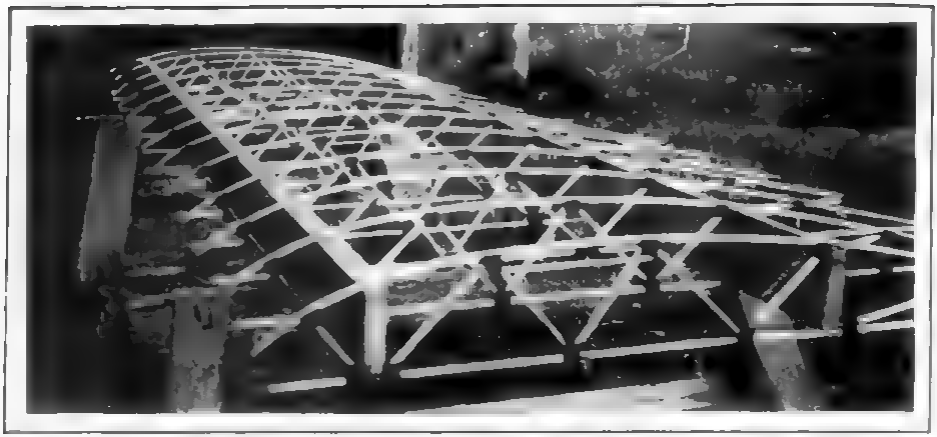
Making the rib jig: The sketch of the rib jig shows how the jig for turning out the twenty-four ribs required, is made.

The jig is mounted on a large plank about two inches thick, so that there will be plenty of weight to support the hammer blows when the gusset plates are tacked on the ribs. As shown in the figure the lower surface of the rib is flat except at the nose, and it will be very easy to saw out the lower half of the jig, using a paper pattern made from the full size wing curve as a guide. Half inch pine is good enough for the purpose.

Since the camber of the upper half of the jig is great, it will probably call for two boards sawed to shape and joined as shown. The half inch material is nailed securely to the planking using inch and a half nails with big heads.

Use the half size rib drawing to determine approximately where the beam centers should lie with respect to the chord, and also where the diagonal struts join the upper and lower cap strips. Design your short struts so that two or more are alike. This can easily be done without sacrificing any strength, and by so doing you will save considerable time in getting your struts ready. Blocks of wood ½-inch thick are put in to show where the spars pass through the ribs, and these furnish a guide for the





Here is a photo of the completed skeleton wing panel for one side of the ship. The fiber side gusset plates are plainly shown. Note the adequate spar depth and sturdy appearance.

vertical rib struts which fit tightly against the sides of the spars when the wing is assembled. The cap strips and all brace struts for the ribs are made from spruce, ¼-inch by 7/16-inch, and long enough to give a few inches extra over the length required by the rib jig, say 5 feet 3 inches. There is danger of breaking the cap strips, especially the upper, when putting them in the jig, unless special precautions are taken.

The best method is to steam the cap strips in a long container, holding at least six inches of water for about two hours. A newspaper is wrapped around the top of the container to hold in the steam.

At the end of this time, the cap strips will be in a pliable condition and can be bent easily without danger of breaking. The next thing is to put the cap strips in some sort of device for holding them in position until they cool and take on a permanent set. The figure shows such a device.

Another way of fixing the cap strips so that they will bend easily is to saw a slot about six or eight inches long in the end of the cap strip where the bend is the sharpest.

Cut a strip of 1/16-inch fibre to fit the slot; apply plenty of glue to the fibre before inserting in the slot. Before the glue starts to set, place the cap strip in the jig, (the upper one first, then the lower one). Next put all vertical and diagonal struts in the proper places, and start nailing on the pieces of fibre or plywood which act as gusset plates to hold the different members firmly together. ½-inch by 20 gauge, is the proper sized nail to use for this work.

As shown on the drawing of the rib jig, small cams are used to hold the cap strip firmly against the sides of the jig. Without these, the cap strips would tend to sag away. These cams pivot around a screw in the plank. The cap strips do not go clear forward on the jig, since a little space must be left for fitting the nose; the nose is a hollowed out and rounded piece of spruce as shown on the wing curve drawing, and attaches to the ribs by means of screws about 1½ inches long.

These screws go through the almost vertical front strut between the two cap strips, as shown.

The nose piece or leading edge, as it is called, fills out the front part of the wing curve. It is not attached until after the ribs are slid on the spars and fixed in position. After the gusset plates have been nailed on one side, the rib is removed from the jig, and the gusset plates are nailed on the other side. Design your gusset plates so that they are as strong as possible without being large. If fibre is used, tinsnips make a convenient tool for cutting the gusset plates to shape. If plywood is used, it will be necessary to use a saw. When both sides of the rib are nailed, the patches may be trimmed with a pocket knife and the end of the rib cut off to the right length. The ribs may now be given a heavy coat of spar varnish and set aside until you are ready for the wing assembly.

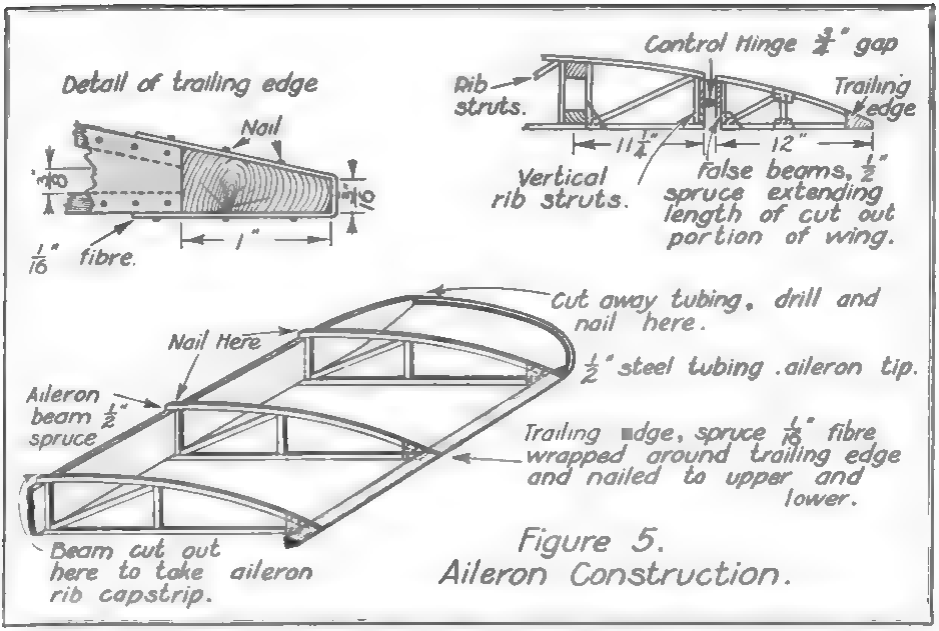


Figure 5.
Aileron Construction.

In addition to the 12 long ribs required, 12 short ribs are needed; also one special short rib in the center of the wing extending from the rear beam to the trailing edge; the gas tank will rest in the space between the front and rear beams in the wing on the left side of fuselage, and the wing will be cut out from the front beam or spar forward in order to afford the pilot a better view.

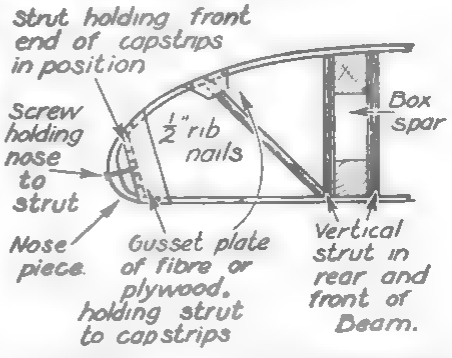
The short ribs are made exactly like the long ones except that shorter cap strips are used and an extra vertical strut is placed at the rear. The false beam for taking the control hinges is attached to these struts by means of nails when the wing is ready for assembly. The sketch below shows method of placing the vertical strut at the proper place.

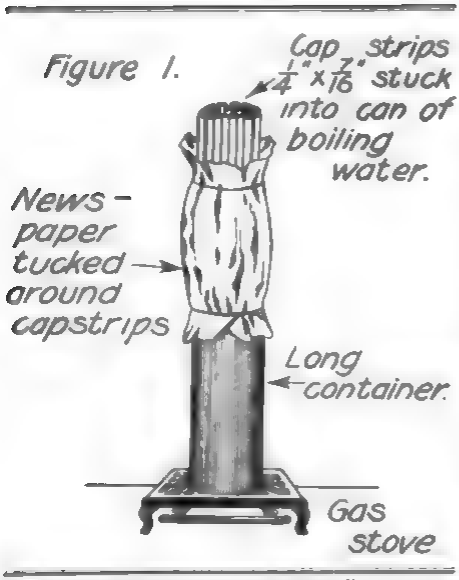
The aileron ribs are built up separately, using the same jig as before. The width over all of the ailerons is 12 inches, and this includes the small beam at the front which is ½-inch spruce and is attached to the foremost vertical struts of the aileron ribs by means of ¾-inch nails.

As shown in the drawing, the wing tips and aileron tips are made of ½-inch steel tubing. Bend it to about the shape shown in the blueprints, cut it to length, and attach at the aileron beam, (tapered at the end). To get a good joint at the points of attaching, cut away half of the steel tubing at those places, flatten it with a hammer, and drill it in two places to take a good sized nail which will be driven into the beam in front and the junction of the last rib and the trailing edge in the rear.

The aileron beam extends four inches beyond the last rib; seven aileron ribs are needed for each aileron. The one in the middle of the aileron should have a special

Figure 4.
Showing method of attaching nose piece after ribs are slid on the wing spars.



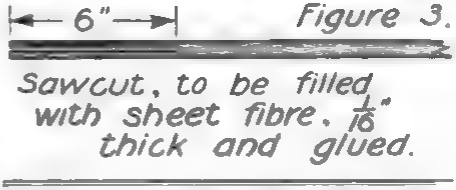


The method for steaming wing ribs so they will bend is shown. Soak ribs in water first.

block in it near the beam so that the aileron horn may be firmly attached. All control hinges are made as shown.

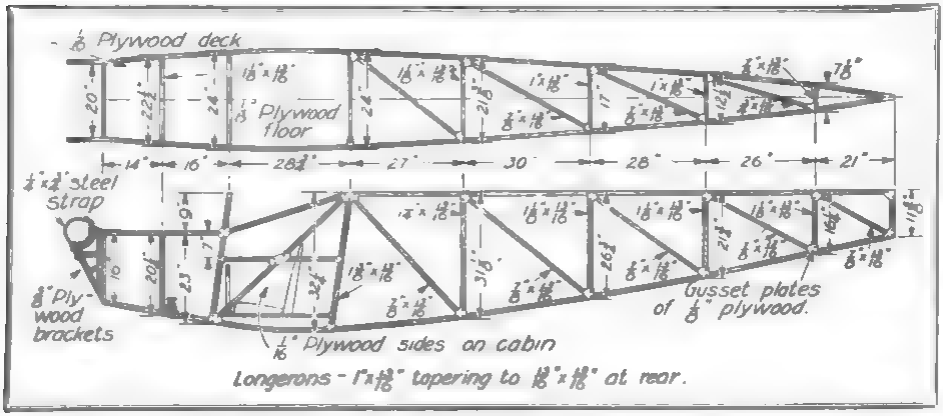
Making the drift or compression struts: These are the members holding the spacing of the spars against the pull of the wing brace wires. They are 28⅞ inches long, 4¾ inches deep, and ½-inch wide, and made of spruce. They are notched at each end, so that they will straddle the fitting where the brace wires are attached. In a future installment they are shown fastened to the insides of the wing spars.

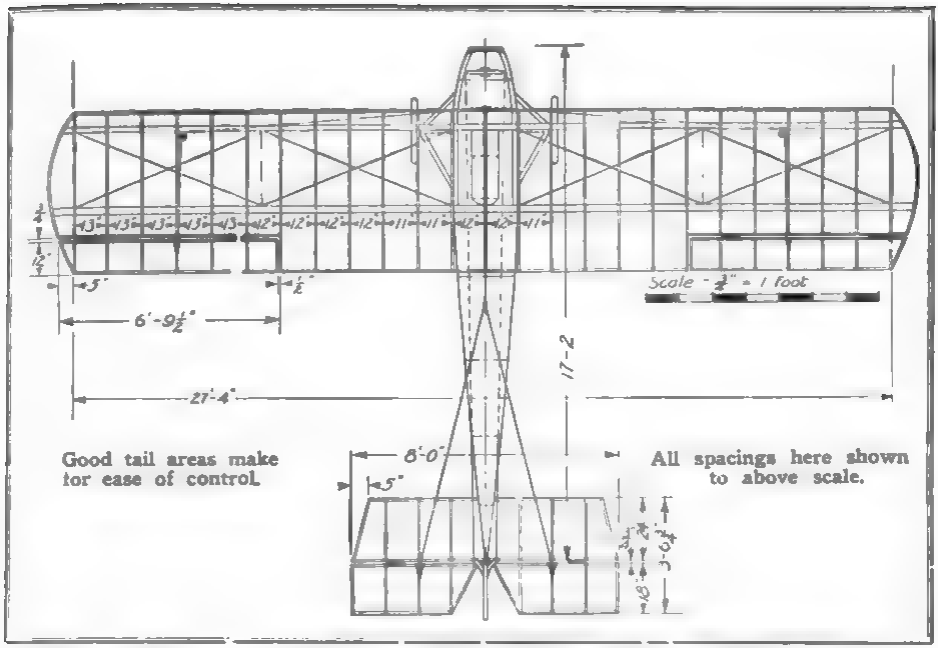
Building up the spars: The wing rib for the Alco sport monoplane is so designed that the two spars are of equal depth. Make the rear spar 25 feet 10 inches long and the front spar 25 feet, 4 inches long. The difference in length is explained by the fact that steel tube wing tip is curved and it must be fastened against the end of the tapered beams. Some of our builders who are somewhat cramped for room prefer to build the wing in two parts, a right and left panel, then join the panels to the center section 24 inches wide which makes the total span 26 feet, the same as if the wing were made all in one piece. In either case, the under side of the 24 inch section of the wing is not covered, in order to allow more head room for the aviator. The spars used are of the box type, using stringers of



The ribs are sawn for the fiber and are glued, so that the gusset plates may be fastened at the ends of the wing ribs.

spruce 1 inch wide and ¾-inch deep. Of course these will have to be spliced once or more if the wing is made in one piece. However, this is not very hard to do; simply join the butt ends, and nail to a heavy block placed at that point. Do not splice the plywood and the stringers at the same place or else the spar will be weakened.





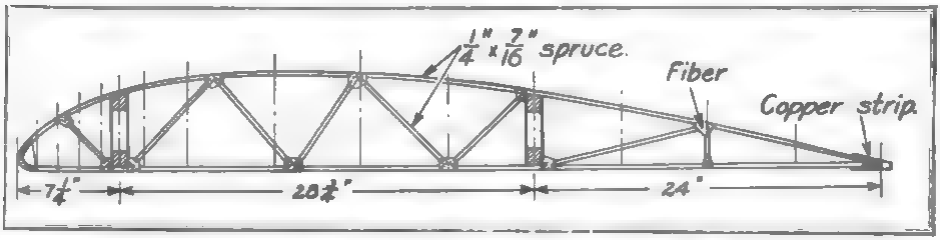
Splice the spar beyond the point of fastening with the external brace struts, if possible.

Use 1/8-inch, two ply mahogany plywood for the sides of the box spar. Be sure to have spruce blocks about three inches wide at all points in the spars where wing fittings and drift struts attach; also where the aileron control pulleys fasten.

According to this system, wire No. 1 is entirely concealed, except where it emerges from the wing a short distance in front of the rear beam, on its way back to the elevator horns. The pulleys shown in the sketch are fastened to the back side of the front beam one above the other, using a simple sheet steel fitting. From the pulley A the simplest method is to bring the wire out of the wing on a direct line to the control stick; this way is open to the objection that it causes considerable head resistance. By the use of two additional pulleys, wire No. 2 may be kept entirely concealed.

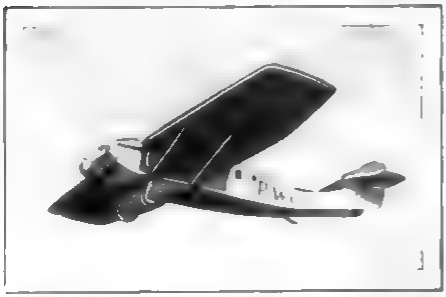
In assembling the wing, the two spars are placed on two horses, and the ribs are slid on to the proper place and nailed there. A carpenter's square is used to get the right angle between the rib and the spar. Next make up the brace wires, and put them in; you will notice that there are two bays on each side of the fuselage; the two drift wires and the anti-drift wire are

(Continued on Page 176)



Ordinates for this Goettingen wing curve (somewhat similar to the Clark Y wing section) will be found in the text. Lay the rib jig out according to this plan.

Trial Flight of New Chapman Airliner Successful



LIGHTS REGISTER VOTES

THE mere pressure of a button rather than uplifted hand or a shouted "aye" or "nay" now registers the voter's intentions in the Virginia House of Delegates.

Red and green lights near the speaker's desk instantly tell which way the trend of political traffic is moving. The quiet flashing of lights seems to add to the serenity of the venerable hall.

SUB V-4 WELL EQUIPPED

THIS huge under-seas monster shown below carries four 21-inch torpedos and 60 mines which it can distribute while submerged. It is the U. S. Navy submarine, V-4, anchored in the Washington navy yard.

Two five-inch guns afford protection to the craft when it comes to the surface.

Sufficient fuel for its Diesel engines can be carried to permit long trips without refueling. The latest type of safety devices has been installed. Every measure for comfort and protection of the crew has been provided.

WITH twelve passengers in its luxurious cabin, the giant Chapman airliner was recently given its first trial flight at Newark, N. J.

The great plane has a wing spread of 90 feet and is driven by two 700 horsepower Curtiss motors. Loaded to capacity, it is capable of staying aloft for 20 hours. The ship was designed by Vincent J. Burnelli.

A peculiar part of the construction is the extreme width of the fuselage, which is almost twice that of an ordinary plane. An unusually comfortable cabin is therefore afforded.

The picture shows the huge plane in its initial flight. Lieutenant Leigh Wade was in command of the trip.

DEVICE OF MANY USES

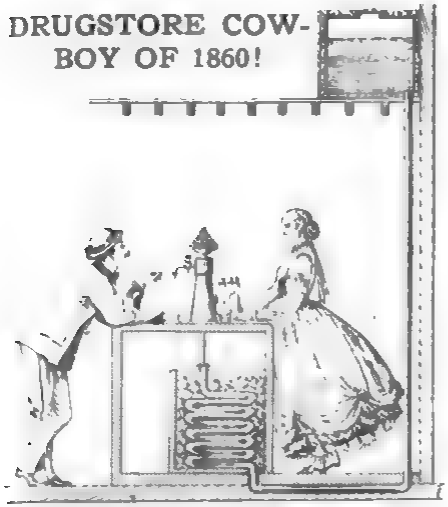
ELECTRICITY economizes effort and time in the kitchen. This machine is the latest in culinary equipment, and its uses are many and varied.

The device will mix bread, beat cake dough, eggs and even has an attachment for sharpening knives and polishing silver. There is also a small brush to clean pots and pans.

Numerous restaurants are installing this equipment as a means of labor saving. This is of extreme value where time is an important factor in the preparation of food.

PATENTS ~ Nutty or Novel?

DRUGSTORE COW-BOY OF 1860!



WHEN an 1860 model sheik went into a drugstore after a shot of sarsaparilla, he leaned nonchalantly on the soda fountain and flirted outrageously with the flapper who took his order. The above drawing, taken from patent office records, came from the pen of a Civil War inventor who had "certain new and useful improvements" in soda fountain design on which he wanted a patent. His idea was to run a pipe up to the attic of the drug store, or confectionery, or what have you, there to install a tank full of soda water which by its own weight would create pressure enough to cause it to flow from the faucet when the handle was turned. Note the shamefully displayed ankles of the flapper attendant, the voluminous skirt with the bottom caught up in graceful scallops, and the floor-cleaning lace petticoat. She seems to be casting a cold glance at her admirer, possibly because his mustaches are not properly curled at the points.

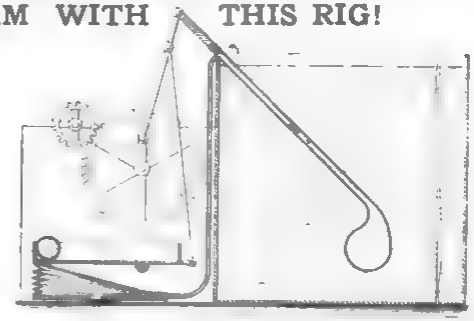
The dusty records of the United States Patent Office hold a good deal of unsuspected humor in their pages. Several choice examples culled from pages of the Patent Gazette are presented on this page.

SHOULDER HARNESS REPLACES PERAMBULATOR

WHAT is the well dressed man going to wear this season? Well, if the hopes of its inventor are realized, the child-carrying belt shown below will be an indispensable part of a father's equipment when he takes his son out for an airing. The device consists of a series of leather straps, arranged as shown and hooked together with steel chains, forming a sling in which the infant sits and waves his hands gleefully at less fortunate contemporaries who must travel in baby carriages, or even in their parents' arms. The proud father slings on the carrier, inserts sonny in place, and saunters forth to greet the world with the debonair, carefree attitude so well expressed by the man in the picture. Perambulator manufacturers are said to be snarling in rage at this threat to their business, and are even sending out insidious propaganda to the effect that this device will make the wearer round shouldered and give him rickets and asthma.

INVENTOR FOOLS UNCLE SAM WITH THIS RIG!

UNCLE SAM refuses to issue patents on perpetual motion machines because they won't work, but the inventor of this contraption fooled 'em good and plenty and sneaked through a patent while the officials were asleep on the job. The idea seems to be that a tube with a large hollow ball at the end is immersed in a tank of water; the other end of the tube is connected with a series of gears and a bellows. The weight of the water causes the air-filled tube to rise to the surface, moving the gears and shifting a lead ball on a pivoting table in such a way that it compresses the bellows, blowing more air through the tube and causing it to sink again and repeat the operation. Sounds nice, but it won't work!

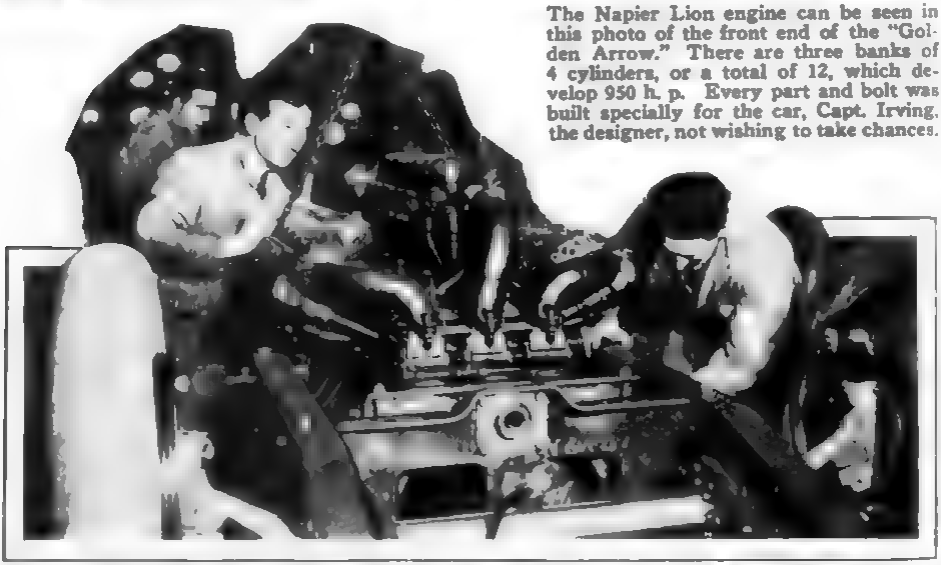


$75,000.00 *Spent for*

Maj. H. O. D. Segrave, famous British racer, has built a marvelous $75,000 racing car whose useful life will be just 1 hour!

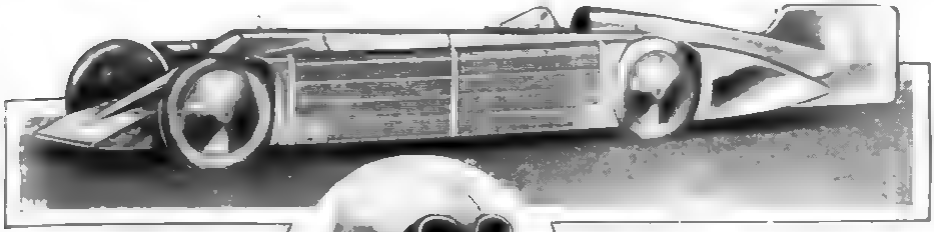
The Marles type steering gear is shown in the photo above. These control each front wheel independently, but in unison. Thus one wheel can "go haywire" but the factor of safety is not totally destroyed. The car is equipped with Dunlop tires, a favorite brand with English folk, and has air-cooled brakes on each wheel.

The Napier Lion engine can be seen in this photo of the front end of the "Golden Arrow." There are three banks of 4 cylinders, or a total of 12, which develop 950 h. p. Every part and bolt was built specially for the car, Capt. Irving, the designer, not wishing to take chances.

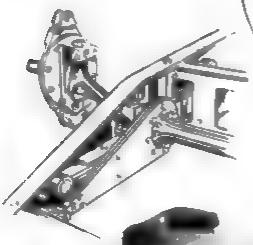


The exceedingly deep channel frames can be seen in this photo, which shows Captain Irving and Major Segrave working on the "Golden Arrow." The three point suspension system of the motor can be recognized, the three Claudel-Hobson carburetors, and the enormous intakes of the Napier engine, which seem like stovepipes. The cooling fins on the brakes can also be seen, and the rake on the king pins. The torque arm on the front axle can be seen in corner.

One Hour's Racing



At the left is Major H. O. D. Segrave, British speed ace who will race for a world's record against time this month. Above is a photo of "Golden Arrow."



Above the torque arm system to allow the springs and axle freedom with great rigidity is shown. Below you may see the two differentials. Two shafts from one engine turn in opposite directions to offset the gyroscopic effect of the other.

MODERN MECHANICS is able to publish here the first photographs received in this country of the remarkable motor car in which Major H. O. D. Segrave hopes to wrest from the United States the world's speed record for land vehicles.

The record, 207.5 miles an hour, is held by Mr. Ray Keech, an American driver who captured Major Segrave's previously held British record. Major Segrave is now in Daytona, Fla., where the attempt will be made about the time this falls into the hands of our readers. Mr. Ray Keech, it is understood, will defend the title with his mammoth 1,500 h.p. car.

About 18 months ago an anonymous millionaire, known only to Segrave, entered the latter's London office.

"I hear you want to get the record back," he said. "Well, go ahead and get a car built. Tell the designer that he can spend what he likes, and that he is to spare no money in making the car as safe as humanly possible."

After recovering from his surprise Major Segrave sent for Captain J. S. Irving, one of the greatest of living motor engineers. Together they planned the car shown here, which goes 92 m.p.h. in low, 166 m.p.h. in second gear, and 240 in high.

In this car, whose final coat of paint will be a brilliant golden color, hence the name "Golden Arrow," Major Segrave's slim body will be encased in a narrow cockpit, armored to protect him in case of turning turtle. Major Segrave, strapped to his seat, will have telescopic sights through which to see the target he steers for as he streaks along his mile course.

At his feet will be a clutch in which the plates are held together by springs exerting a pressure of 3,000 lbs. to the square inch.

The "Golden Arrow" will be started by a portable motor. So great is the maximum attainable top speed that the car has been geared down to a speed of 240 m.p.h. maximum. Captain Irving might tell Major Segrave not to drive any faster than 240 m.p.h. but he knows that when the Major gets into the cockpit he presses his foot on the accelerator and shouts "Kismet!"

The useful life of the car will be one hour. To put the whole car through the hour of terrific grind which it is expected to stand will cost $75,000, or better than $1,000 a minute. The price of speed!

A GYPSY Car for Touring

Part Two of Plans for a Camp on Wheels

By RAY F. KUNS

In the April issue, Mr. Kuns told how to lengthen out a chassis and build the framing for a home-made touring car de luxe. In this second installment of his fascinating article, he gives pointers on finishing the body of the car and fitting out the interior.

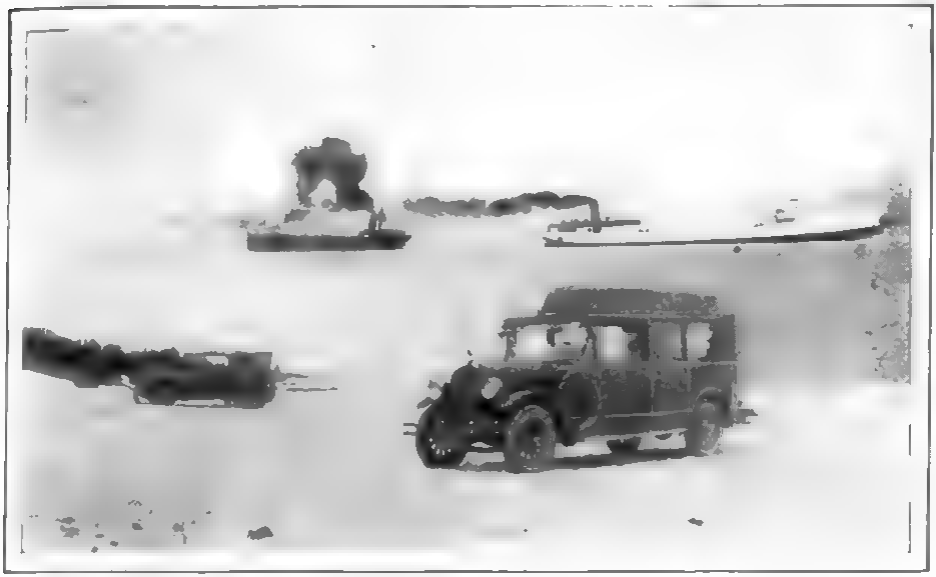
IT MIGHT seem to the amateur that the building of a door with glass sliding in it is a tremendous task. This is not necessarily so difficult if the builder will observe the material used in constructing automobile doors. Make an inspection of some of the models which are available. The reader will remember that the inside of the post is straight. This is made thus in order that glass may be installed in the windows and doors and slide true. A prime consideration is maintaining the glass in a plane. This is easily done if a little thought is given to it.

Fig. 1. This view shows an inside view of the rear quarters of the gypsy car, showing how the durable imitation leather finish is applied.

In order to provide the grooves for the glass to slide in, strips are nailed on the inside of the posts. These strips should be made from ½-inch spruce, poplar or pine. The width of the strip will depend upon the post it is fitted to, varying usually from 1½-inch to ¾-inch. These strips on the inside of the glass will usually be about ½-inch wide as well as ½-inch thick. Those strips on the outside will be wider at the bottom than they are at the top, owing to the form of the post. Before fitting the doors to the body, the rail which forms a support for the floor is run in for the full length of the car body. There are no sills on the chassis frame. A strip of the light wood ⅞-inch thick and 2 inches wide is bolted on the car frame side members.

In the center of this strip another strip ½-inch square is nailed. This is to form a rabbet for the floor, which should be made from light wood ½-inch in thickness. These facts must be determined in connection with the rail at the floor line, which is fitted into the post so that the floor may be level.

When all of the frame is complete the



Here is a completed view of the gypsy car, built by Mr. Kuns, touring on the shores of Lake Michigan. Note the method of carrying a boat on the roof of the car. Photo by the author.

door frames are built. Cut out the top and bottom rails which will conform to the door opening, matching up with the posts already in position. Cut each one of these posts ⅜-inch short, likewise with the rails. Now frame these parts together with half lapped, screwed joints, as shown in Fig. 2. When the door is installed it will be found that it has 3/16-inch clearance all around. This is the amount necessary for proper swinging. Frame a center rail into the door on the outside and a rail on the inside as suggested in Fig. 3. This figure shows the inside of the door as it is hinged in position with the door lock and the glass rail and lift in position.

The glass lifts are secured at the junk shop or from an old sedan body. Hinges and other hardware likewise. If an old sedan body is dismantled a great many pointers will be secured from the door construction as well as many of the little fittings which are necessary around the door. Refer to Figures 2 and 3, which show two styles of lifts.

Covering the Roof

If it is not desired to carry anything on the roof the sheathing will not need to be laid tight. However, in the job illustrated on this page, it was desired to carry a boat on the roof, so the matched sheathing was laid tight. This permits the owner to walk over the roof when lifting the boat on or off. Of course, baggage could be carried on the roof quite readily if it were desired, with this close form of construction. The carriage builder or the automobile builder will supply you with material for this roof sheathing, or you may secure it in the form of thin unmatched lattice stripping 5/16-inch thick, from a lumber yard. This stripping may be laid with 1 to 1½-inch clearance between strips; or the method used by the motor car body builder may be used, which is to take a width of chicken netting with about a ½-inch mesh and stretch it snugly over the rafters and tack it to the plates. This makes a very light form of construction and is quite satisfactory.

Reference was made in Part I to the application of the wire covering of the body. Over this wire a cover of one or two thicknesses of cotton batting is placed. The imitation leather, which may be secured through the jobber or the carriage works, is then cut in panels and stretched over the cotton batting. If care is used in applying this, it will be found that it may be worked over any form of curve without wrinkles.

Fig. 2. This shows one method of framing in the glass and lifting mechanism of windows.

A little experimenting is necessary, but the job is not particularly difficult. Run the tacks in straight rows in the center of the posts and rails and then it will be possible to cover the tack heads with aluminum moulding, as shown in the picture on page 143. The trunk may be covered with the wire or it may be boxed up with the thin matched sheathing such as was suggested for the roof. The top of the trunk may be made up from thin boards and covered with the batting and imitation leather, or it may be of sheet metal covered with some of the imitation leather glued on to it with linoleum glue.

All sedan type windows are fitted with felt which is applied in a standard groove $\frac{5}{8}$-inch in width and about $\frac{1}{2}$-inch in depth. This felt may be secured from almost any dealer at a very reasonable price. Secure some of the felt, then provide the groove by nailing in the window strips as suggested earlier. When tacking in these strips use a small finish nail so they may be removed, especially those on the inside; those which form the outside of the groove may be nailed permanently, if it is certain that the glass and the glass lifts with the felt stripping are all working properly. After these strips for the window guides are nailed to the posts and to the top rails of the windows, the imitation leather may be run on and tacked in place, over a layer of cotton batting. Drive the tacks on the inside of the groove under the felt so they will not show.

The strips on the inside of the window are to be covered with the imitation leather without any cotton batting, the tacks being driven from the back side of the strip. These strips are fastened in with nickel plated round head screws so that they may be removed on any occasion when it is desired to remove the glass.

The inside of the car is lined with a shade of imitation leather which will be a proper match for the outside, using a lighter shade or color. Heavy cardboard may be used for the backing for this covering, or light wood, such as may be secured from used glass boxes, may be used. The imitation leather is first fitted over the inside of these panels pulled around the edges of them and either tacked or pasted in position. These panels are then assembled over the posts on the inside of the car by means of screws, a few only being required to hold them.

Building in Fixtures

Before procceding with the floor and ceiling covering, it is well to lay out any fixtures that are to be built into the car. One of the most satisfactory methods devised is to use the section across the rear as a container for several drawers and a berth (Note Fig. 1). In one design of this kind the owner built a full length wardrobe in one corner so that he could hang ladies' wearing apparel or men's suits on hangers

Fig 3. Another type of window lift, the parts for which can be obtained cheaply from almost any dealer in junked cars and parts.

In applying the covering to the body of the car, the fabric is tacked to the wooden posts in straight lines and covered with attractive aluminum sheathing as shown in the above picture. The shiny metal fitments present a striking appearance in contrast with the soft body colors.

in this wardrobe and thus preserve them in good order and free from wrinkles. A compartment about 2 feet deep and the full width of the car may be built across the rear end and covered with imitation leather trim.

Another method of providing space at the rear is to build in corner cupboards with shelving and small doors opening into them. These corner cupboards are built with a curve so that considerable room is secured on the inside. In order to do this, lay out the shelving and fasten it to the posts, then use some of the light sheathing to frame up part of the cupboard. Build a door from the same material by nailing it on the battens, curved the same as the cupboard.

This door may be hinged to the cupboard after which it is removed and both cupboard and door covered with imitation leather. The fronts of the drawers which are in the cabinet or locker at the rear are likewise covered and trimmed with imitation leather. The beautiful finish of the inside of the car is an item which immediately attracts the attention of all people and it is a fact that when a car built along these lines stops on the camp ground there are many interested observers and inspectors to express their delighted approval. Fig. 1. shows the appearance of the rear quarters when fitted up as suggested above.

It is not recommended that built-in seats be used in the gypsy car. Portable chairs will be found entirely satisfactory as far as rider comfort is concerned, and they have an additional advantage in being able to be removed during overnight stops to serve as camp furniture. In the case of the driver, it is advisable to provide several hooks to anchor his chair to the floorboards so that sudden stops from quick application of the brakes will not dislodge him. Coach type chairs, or "seventh passenger" chairs, may be used.

In the concluding article of this series, appearing in the June issue, full details for construction of interior fittings such as in-built refrigerator, table, etc., will be given.

This view shows the same interior appointments as Figure 1, except that the berth is opened, showing the space economy of this method of accommodating sleepers on bus.

Automobile Vanity Case is the Latest Novelty

AUTOMOBILES have become so important a part of daily life that they are now made in the form of vanity cases for women, as pictured in the photo at the left. The automobile vanity case is hinged on the bottom and opens like an ordinary handbag, containing compartments inside for powder puff and various accessories favored by the up-to-date woman. Leather is used in making the handbag. The door of the auto contains a compartment in which small change is kept.

SAWDUST AS FUEL

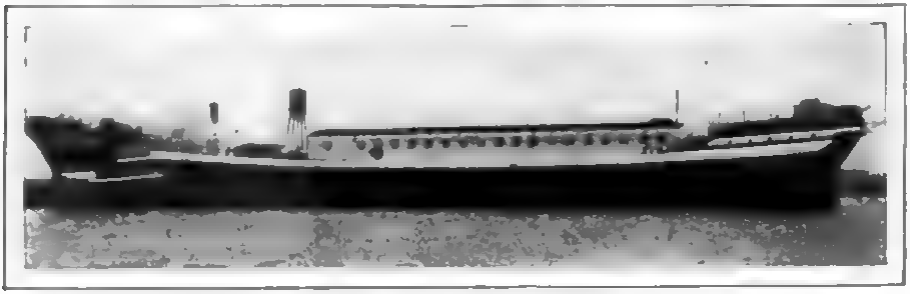
SAWDUST, until recently a waste product which caused lumber mills considerable expense in disposing of it, is now used to fire boilers, thanks to the perfection of a new sawdust burner which makes it possible to utilize this waste product as fuel. Before sawdust could be used as fuel, it was necessary to develop a hopper and grate which would not clog or smoke.

BOY BUILDS MODEL AUTOS

USING waste bits of wood, tin cans, and wire, a Los Angeles high school lad has made a success of a unique business of building and selling model automobiles for toys, advertisements and window display purposes. He carves the bodies out of pine and uses old tin cans for fenders, running boards, and springs. Celluloid is used for the windows and mouldings are made of cardboard or solder wire. Springs are rubber insulated so they run as smoothly on the pavement as on carpet. Discarded dry cell battery terminals make the hub caps.

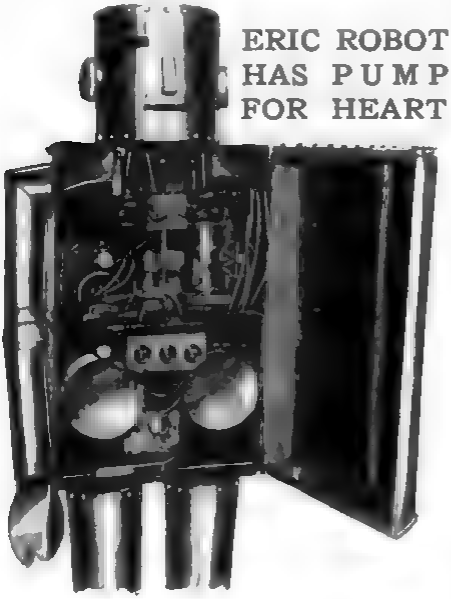
MYSTERY SHIP SUSPECTED OF BEING GAMBLING BOAT

THE *Monfalcone*, a mystery ship suspected by the authorities of being a floating gambling palace, was recently towed out of Los Angeles harbor to be anchored at sea off the California coast. The *Monfalcone*, as shown in the photo below, has no sails or other motive power and must remain where it is anchored. Note the water tank on the deck, furnishing running water for the cabins. Federal authorities are trying to find legal ways of putting the ship out of business.



Microscope Attached to Glasses in Use by Doctors

MAGNIFYING lenses which are worn like spectacles have now been placed on the market for the use of watchmakers, dentists, doctors, and others whose work calls for frequent use of the microscope. As the photo shows, the lenses are attached to ordinary spectacles by means of a clip, and are focused by sliding them back and forth on their base. The advantage of the spectacle microscope lies in the fact that it can be carried in the vest pocket for field work and brought into use at a moment's notice. Another advantage is that work can be examined in the hands without the necessity of mounting the object on a slide, as is necessary in the case of the ordinary table microscope.



ERIC ROBOT HAS PUMP FOR HEART

ERIC ROBOT, London's famous mechanical man, opened his heart to the public the other day to show just what was in him. As the photograph shows, Eric's "insides" are so mechanically complicated that a physician called upon to operate on him for appendicitis would hardly know where to begin. The two bellows which may be seen in the picture represent Eric's lungs, and the small furnace is his stomach. The pumping machine does duty as his heart, being connected up with various portions of his person by means of hollow tubing.

DISPOSAL OF JUNKED CARS IS PROBLEM

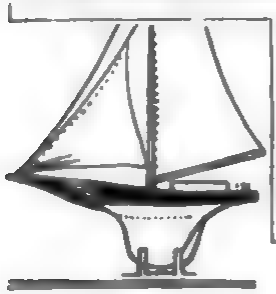
DISPOSAL of old automobiles which have been discarded by their owners is a growing problem in the city of New York, where thousands of decrepit cars are abandoned annually. Vacant lots are crowded with junked cars, and the expense of removing them is considerable, this work devolving upon a special squad of the street cleaning department. Several suggestions for disposing of these old hulks have been made, among them the idea of towing them out to sea and dropping them overboard, and the scheme of building a smelting plant where the metal can be melted down and reclaimed.

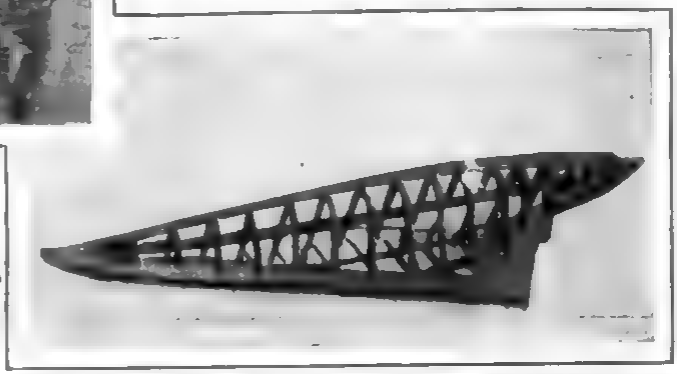
LAMP HEALS EARS

EAR diseases are now being successfully treated by a new lamp developed by a German technician, known as the non-burning Landecker lamp. It has proved especially successful in treating serious ailments such as inflammation of the inner ear, employing the curative properties of light and heat. The patient, as shown in the photo below, sits with the lamp rays concentrated upon the infected part of the ear.

Winners in the Sailboat Contest!

In this, the most popular model contest Modern Mechanics has held, photos of all sorts of models were submitted. The editors were hard put to determine the winner of the beautiful silver cup and the $25 cash prize. Robert White of Chicago, was chosen first with his model of the sloop Miss Chicago, at the left.





Miss Chicago, winner of the contest. Length 55½ inches, beam 10½ inches. She was built to scale, even to frames and planking.

FROM the four winds of heaven entrants sent photos of their model sail boats to MODERN MECHANICS Model Sail Boat Contest. The interest shown in the contest, and the really nice boat toys which the readers of the magazine have built, gave the Editors a real task when it came to selecting the winners.

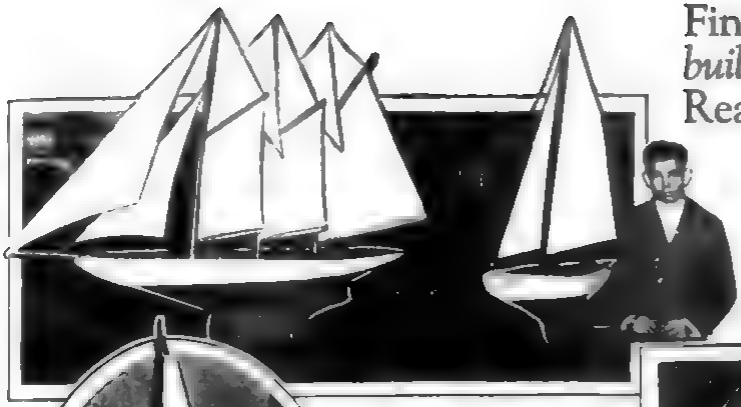
First prize went to Robert White, of Chicago, for his splendid model of an R class racing sloop. Mr. White's model is 55½ inches long, 36½ inches on the load water line. The beam is 10½ inches. The model draws 8½ inches of water and has a sail area of 1,340 square inches. She is shown above, ghosting along in a light air, and her framing is shown in the side view. It can be seen that in planking the model, using regular cross section molds and frames, Mr. White went to a great deal of labor in the making of his model.

The cup and the $25.00 prize money have been sent to Mr. White. The picture of the cup was published on page 125 of the January issue.

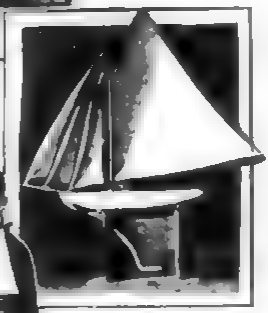
Second prize of $10 was awarded to Mr. Jesse E. Kelly, for his fine models of "Queen" and "Osprey." Mr. Kelly built the boats himself and is but 13 years of age.

The three third prizes were awarded without discrimination as to order to Allan Niles, Hartland, Wisconsin, Sam Peters of Kenova, W. Va., and Arnold Pearson of Evanston, Ill. All these contestants sent shots of boats which showed real insight in-

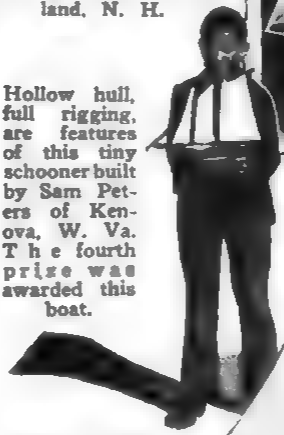
Fine Models *built by* Readers



"Osprey," sloop, and "Queen," schooner, win second prize of $10 for Jesse E. Kelly, of Ashland, N. H.



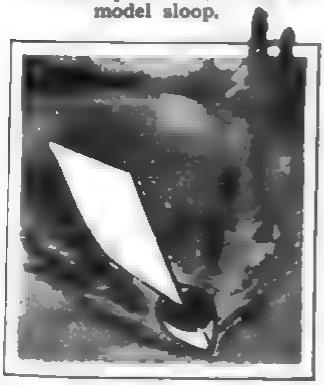
Hollow hull, full rigging, are features of this tiny schooner built by Sam Peters of Kenova, W. Va. The fourth prize was awarded this boat.



Norman Sutherland, of Portland, is in the money with this model sloop. It has 3 head-sails. Prize, $5

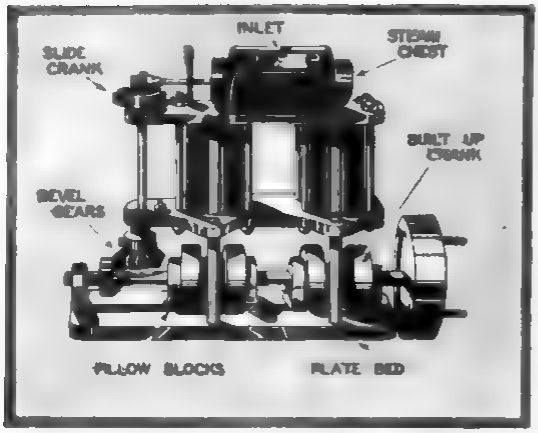
Arnold Pearson, Evanston, Ill., wins third prize of $5 with this model sloop.

Allan Niles, Hartland, Wis., built this ballasted model of a sloop. The rudder can be set to steer the boat according to the draw of the sails.



Here's a view of Allan Niles' boat under sail on a pond in Wisconsin, while the builder and a friend look on from the embankment behind.

to the principles of model sailboat design and building, and the editors are pleased to announce that in the immediate future plans for several easily constructed model sailing vessels will be published in MODERN MECHANICS. These will be designed by Weston Farmer, naval architect.



That plans for small engines of all kinds are eagerly sought by Modern Mechanics readers is attested by the amount of mail the Editors have received following publication of the Wall Engine and the Dynamic Model Aeroplane motor. Here is another of a string of fine designs!

Design for a Built-up FLASH STEAM ENGINE

By GUS ADELBERT DECKERT

"WELL, that's a fine engine, but I can't see it for my new shop. I haven't tools enough to build it."

How often has some friend made that remark as you recommended your pet model to him as a starting project for his workshop? Either the patterns would cost him too much money, or they would be too hard to make, or he has no lathe. Always there is something objectionable in the design of the model. Well—

No one can offer that complaint about the little engine I have designed and for which the plans are shown in this issue of MODERN MECHANICS.

If you have a file, a vise, and a small set of drills and taps you can build it. And when you are done—no need to have a boiler to prove that it works. Just hook it up to a tank of compressed air and watch it hum.

To eliminate lathe work, the cylinders are made of Shelby steel tubing ¾-inch in inside diameter. This tubing size can be had at any bicycle shop. A length 1 5/16 inches long is cut on each cylinder, using a hacksaw. The flange for the seat of the cylinder is made by scribing the depths and filing. See blue print to right—figure 1.

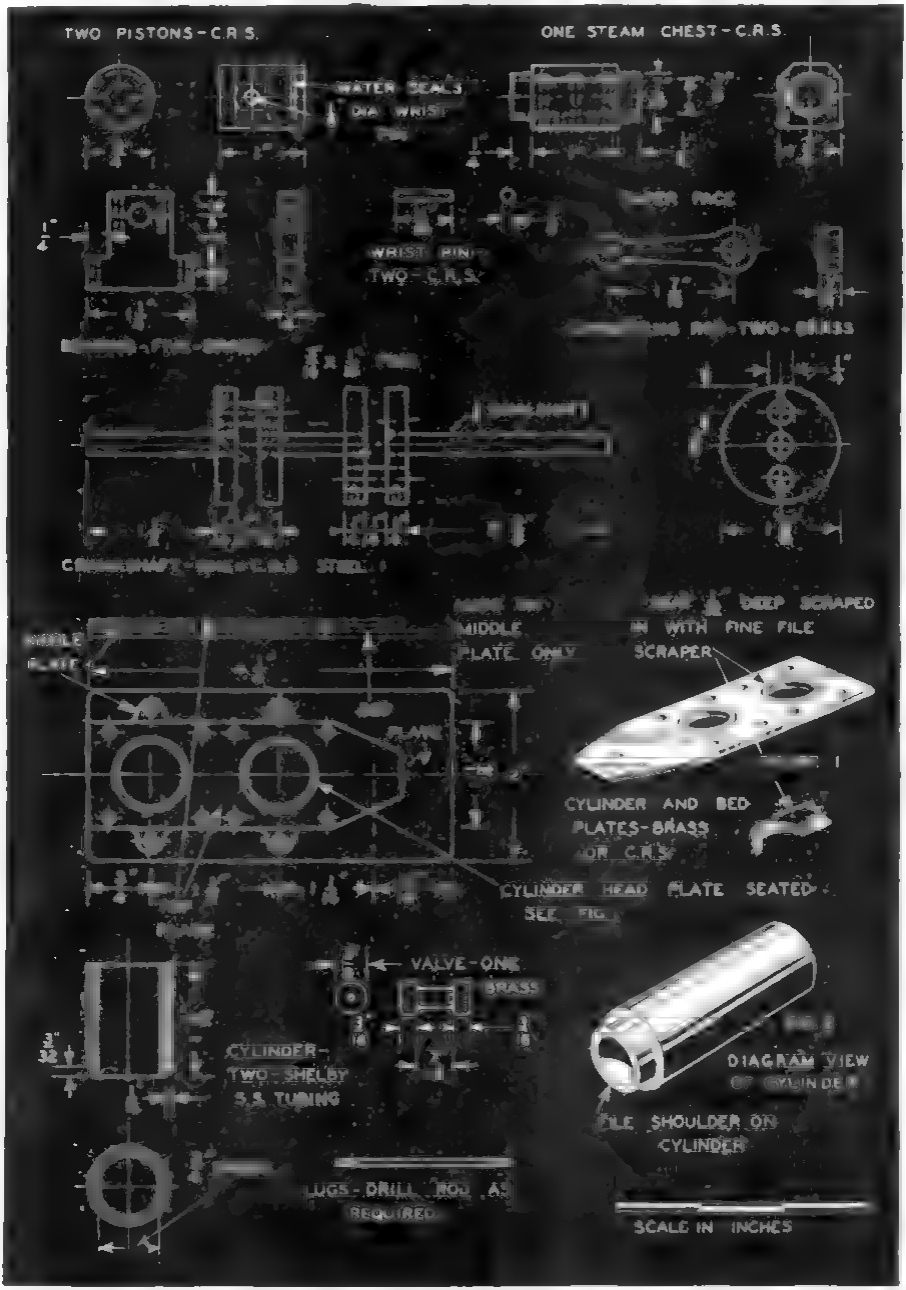
Cardboard templates are made of the top and bottom cylinder plates, and after the pattern size has been transcribed to the ⅛-inch cold rolled sheet steel plate by scribing, the plates are sawn and filed to shape and drilled to the sizes and dimensions which the drawings show. The bed plate, simpler, is made the same way of the same material.

The drilling of the holes in the top and bottom cylinder plates will have to be accurate. And though the cylinder head can be soldered to a tight enough fit for saturated low temperature steam, if you will prick punch the centers of the cylinders and scribe an inside and an outside line with the edge of the lip of an extension bit, you will have a guide to serve you in scraping down a seat for the cylinder head which will be steam tight for flash steam. A scraper made from the tine of a file, hardened, cuts very well and by a sort of hand engraving process you can cut a very fair groove in a couple of hours' time. The trouble will repay you. See figure 2 for the method.

If the groove is only 1/32-inch deep that will be enough.

If the top cylinder plate is cut to shape

Blueprint of Built-up Steam Engine Which is Made Without a Lathe



Here are complete details for the building of a powerful, simple little twin cylinder steam engine. It can be built at home in the ordinary workshop which is equipped with nothing but a file, a hacksaw, some drills and a vise. No lathe is needed to complete a most satisfactory engine. With flash steam, this motor will drive a three-foot model hydro at 30 m.p.h.

first and then drilled it will serve as a jig for cutting the middle and bottom plates.

The valve chamber is of the piston type with inside steam admission. This means there are no pesky packing glands to steal power because of friction. The idea is a good one. Steam is admitted to the middle chamber and the exhaust is free at the end of the valve!

The chamber is made of a piece of ¾-inch cold rolled steel, square bar. The steam ports are ⅛-inch in diameter. The diameter of the valve is 7/16 inches and it is made of cold rolled steel shafting. It is ground into the scant 7/16-inch hole in the valve for a perfect sliding steam tight fit.

The valve is motivated by a Scotch crank action driven by bevel gears which can be purchased from the Experimenter's Supply House, Box 10, Station Y, New York, N. Y. These people will gladly send catalog for 10 cents in stamps. Balance of the supplies needed for the construction of the engine can also be bought from them. Flywheel, too.

The pistons are of ¾-inch cold rolled steel shafting, and are bored out very carefully. They must be lap ground in to fit the cylinders.

One or two water seal rings must be filed into the pistons to take the place of rings. The boring for the wrist pins must be carefully done so as not to bruise the piston in the vise.

The connecting rods are made of ¼-inch thick brass plate. The shape and dimensions are in the drawings. Taper from top to bottom face.

The crankshaft is unique. It is made of webs cut from cold rolled steel shafting 1⅛ inches in diameter and ¼-inch wide, each web. Three of these webs are needed. Carefully center and drill a ¼-inch hole for the crankshaft. Use a drill one or two thousandths undersize. Using one web as a pattern, when another hole ¼-inch has been bored exactly ⅜-inch from the center, the other webs are made ready for the ¼-inch drill rod which is used for the shaft.

Two of the crank webs are now driven onto a piece of the ¼-inch drill rod of the right length for the center throw as can be determined from the drawings. Make sure the center holes are in line. Then drill the shrink fit pins, driven in as in the blueprint. The crank is ready for use. If it has been carefully, tightly fitted it will give good service and never come loose.

Bearings for the crankshaft are made of ¼-inch brass plate. These are sawed to shape with a hacksaw, evened up with a file, drilled, slotted and shimmed. You need four of them. The split type bearing is used. To line them up and drill them onto the bed plate, put them along a ¼-inch drill rod like beads, center the rod, clamp it and do the necessary drilling in the little pillow blocks.

This engine is a serviceable, good machine. It should not weigh over a pound or so when done, and if used on flash steam it will develop tremendous power and turn at about 4,000 revolutions a minute. It can drive a model boat easily, and if you have a light enough boiler, I'd wager it would fly a model airplane. And that is an interesting conjecture!

Win Your Wings!

JOIN Modern Mechanics' great Aviation Contest in which a course in aviation will be awarded the lucky winner! Scores of other prizes! Full details and list of awards will appear in the June issue, on sale at all news-stands May 1.

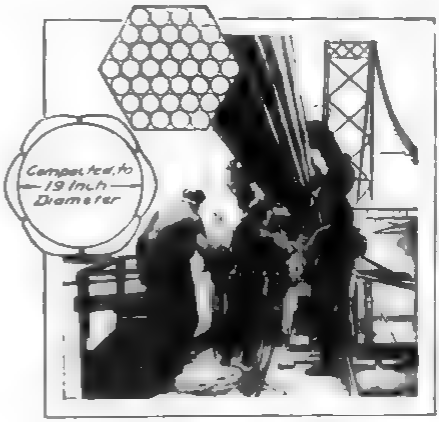
Squeeze Cables to Support World's Longest Bridge

USING powerful hydraulic clamps, the workmen in the picture at the right are compacting the steel cables that will support the longest bridge span in the world.

The structure will bridge the Detroit river at Detroit, Mich. It will be called "Ambassador" since it will link Canada and the United States.

Each of the six jacks in the hexagonal clamp exerts a squeezing pressure of 30 tons. The inset shows how the 7,622 wires of each cable are laid during building in 37 strands of three inches in diameter. The intense pressure changes the shape of the cable from a hexagon 21 inches across the corners, into a 19-inch circle.

The individual wires are laid parallel and therefore adjust themselves readily. While under this terrific strain, the cable is wrapped in the manner illustrated in the circular form. The cables will support the full weight of the bridge, totaling 12,000 tons.



SANITARY DRIER URGED

THE DAY of the grimy roller towel is fast vanishing. Hotels, restaurants and other public places where washrooms are a necessity are installing the automatic hot-air drier shown at left.

The press of a foot pedal is all that is necessary to operate the device. A steady blast of hot air is forced from the nozzle. By massaging the wet hands for several seconds, the drying process is facilitated. The hands are thus dried faster and in a more thorough manner than if a clean towel were used.

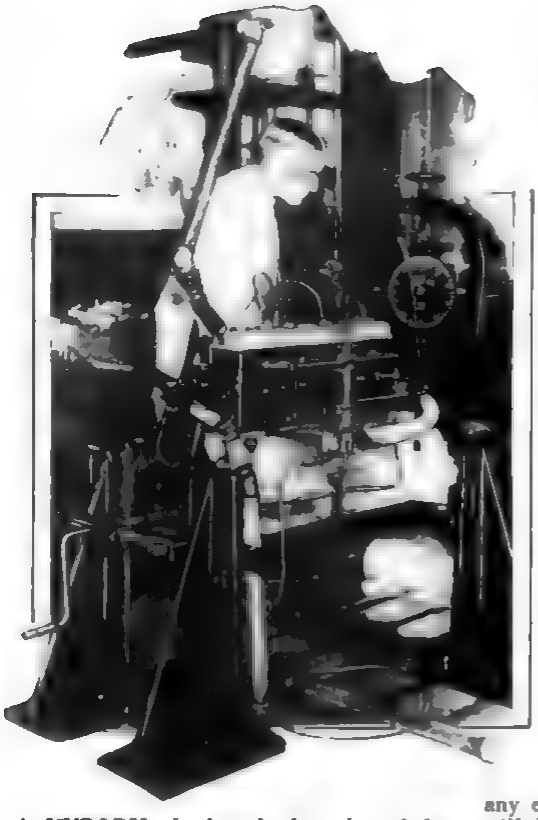
Health authorities throughout the country are advising the installation of this machine in all public wash rooms. Prevention of a great amount of disease that is now spread through the use of unsanitary towels will thus be possible.

SHE'S SOME FISHERMAN

MISS GLADYS INGLE, stunt flyer, believes in proof. That's why she had her picture taken with this 212-pound black bass which she caught off the coast at Hermosa Beach, California.

The giant fish was brought to submission only after a struggle lasting an hour and a half. Miss Ingle hooked the fish with light tackle, a fact which made the landing extremely difficult. The hook from which it is suspended in the picture is merely for the purpose of the photograph.

This huge black bass was caught with the fishing tackle Miss Gladys Ingle is holding.



How

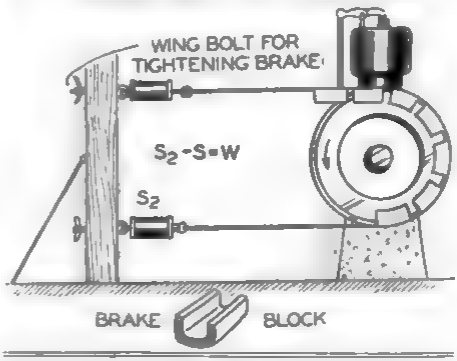
So many readers of Modern Mechanics have asked "How do engineers test their motors; how do they know how powerful they are?" that we asked Mr. T. S. Asgaard to write us a simple story showing our readers how motor power may be measured. Mr. Asgaard has gone further, showing the simple calculations which are made, and how the experimenter and model builder may test the output of his own home made engine, even if it is only a "one fly power" job!

ANYBODY who has the least knowledge of mechanics can test the horsepower of an engine exactly if he can rig up a stand such as is shown in the drawings here. Often it is needful to know just what power a motor will actually develop so that some machine may be designed around it. For instance an airplane or, perhaps a car, will want to be planned about some power plant you have.

Usually the way to get the power is to send the motor to a testing laboratory—but that isn't necessary. The power can be figured with a home made dynamometer, even if it's a "one fly power" toy motor.

Everybody knows that a horsepower is equal to the work done in lifting a 33,000 lb. weight 1 foot in 1 minute. This can be expressed in any form where one of the factors of the equation can be altered so that the others are in proper relation. Some of these other ways of defining a horsepower are: 33 lbs. lifted 1,000 feet in one minute, or 330 lbs. 100 feet in one minute. The problem of finding the horsepower of any engine is to find how many pounds it will lift and how many feet in a minute. This is determined by a brake and scale apparatus about to be described.

The two values when multiplied together will give us the number of foot-pounds. The expression is FT.-LBS. Then by divid-



In the absence of a large scale, two spring scales can be used as shown, subtracting the reading of one from the reading of the other to give the pounds pull registered.

Motor Horse Power Is MEASURED

By T. S. ASGAARD

ing the figure got this way by 33,000 the number of h. p. will be the answer. It is the same for a tiny engine as for a huge steam engine.

There are four ways of finding the number of foot-lbs. which an engine will develop. The most elaborate is the dynamometer method in which an engine is hooked up to an electric dynamo and the resulting generated electric output is read from an ammeter graduated to read in h. p. and fractions. It is the simplest, and probably the most accurate, but only experimental laboratories have the right kind of equipment. The Sprague type dynamometer is used by most of the college laboratories.

The next simplest is the reaction stand test type. This is better than the simple Prony Brake test type of power measuring stand as it eliminates friction losses. It is based upon the proposition that the "torque" reaction of a motor at any given distance along a lever arm is exactly equal and opposite to the force generating the power. Consequently the motor is hung on a free cradle which pivots about an axis concentrical with the crankshaft, and then the motor is provided with a resistance so that the torque can be measured. This is calculated in the same way that Prony Brake horsepower is measured.

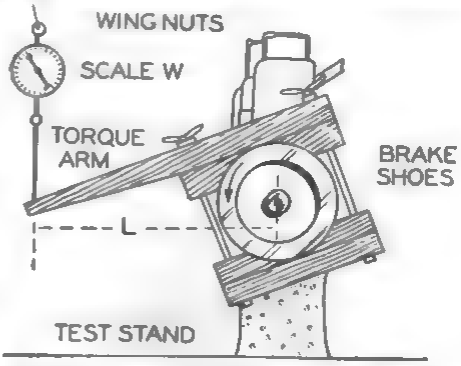
The simplest form of all types of measuring horsepower is this selfsame simple Prony Brake.

In this method of measuring the pounds a motor will lift, the motor is securely anchored to a base so that when a brake is applied to the flywheel it will remain solid. There are brake shoes which are made of hard wood and which should encircle at least 9/10 of the flywheel so that there will not be much heat on each one. If they are brought to bear on less surface they will heat up. Two long bolts are mounted with wing nuts for tightening so that the brake can be applied. There is a long arm about four feet long to which the brake is attached and which is fastened to a scale. The line between the shaft center and the point at which the scale is attached must always be horizontal and level, because one will get an erroneous lever arm if you don't see to this detail.

To complete the outfit you will need a pair of tension scales and a watch and a revolution counter.

Now the method for measuring the horsepower for any engine from a home made steam engine to that of a big boat engine is the same. The motor is warmed up. The shoes are completely released. Gradually tighten the shoes and open the throttle. When the throttle is wide open tighten the shoes till the motor just begins to labor ever so little at around the rated speed you wish to determine the horsepower for. Keep the brakes applied but for a few seconds. Use 10-second readings and multiply what the counter says by 6, to get the r.p.m.

Once you record the pull in pounds at



One of the ways in which power of an engine may be found is the Prony Brake test. The brake is tightened until the motor barely slows down at the number of revolutions desired. The scale weight recorded times the lever arm gives the ft./lbs.

any certain r.p.m. you are through. You can calculate your horsepower.

What you must consider first is the actual distance that the end of the arm would have traveled if it had been left free to swing. If the end was four feet from the center of the flywheel the circumference would have been 2x4x3.14 or 25.12 feet. At 1,200 r.p.m. it would have covered 1,200 times that distance or 30,144 feet.

That is the distance through which the registered pull would have acted during one minute. If the scale was found to read 46 lbs. the foot-lbs. would have been 30,144 x46 or equal to 1,386,624 foot-lbs., which, divided by 33,000, equals 42.02 h.p. It will be easier to write all factors in a formula like this:

$$\text{h. p.} = \frac{2 \times L \times 3.14 \times W \times \text{r. p. m.}}{33{,}000}$$

L is the length of the arm and W is the lift of the scales.

It may be found that the motor will heat at the brake and this means a loss of power in the form of friction. It is to be noted that the heat is generated by the motor and the results given by this test, while not accurate, would give a *lower* power than that actually developed. One way to measure is to read the differences in two scales and use the diameter of them as L. Try this method next time in your small motors.

A PERFECT SALESMAN

THE IDEAL postal clerk who never gives five twos for two fives and never argues with patrons, is being tried out in the post-office in Washington, D. C. As might have been guessed, it is an automatic machine which dispenses stamps and makes change quickly without charge.

If the machine proves successful, it is probable that similar ones will be installed throughout the country by the government.

SAFETY DEVICE TRIED

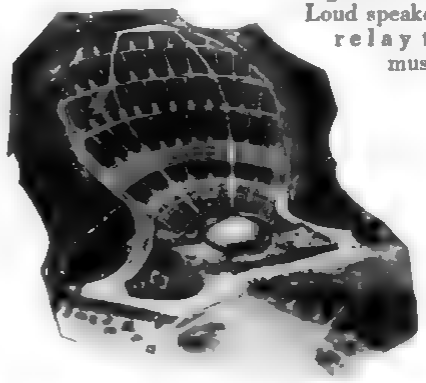
MAN'S mastery of the sea is a step nearer as a result of recent successful tests conducted aboard the submarine S-4. Three times men escaped from the submerged vessel from a depth of 40 feet of water.

The safety devices used are to be tried again at varying depths in an effort to prove their perfection.

ONE OF LARGEST ARENAS

HOLLYWOOD BOWL, where thousands of Californians enjoy outdoor entertainments, is one of the largest arenas of this type in the world.

Nine pianos were used at one time in a recent concert, filling the air with entrancing melody. Loud speakers relay the music.



Remarkable view of Hollywood Bowl, where outdoor entertainments and concerts are held.

Chemical Man Shows Human Digestive Process

DEMONSTRATION of the process of digestion of the human body is possible through the creation of a chemical man by Dr. Benjamin Gaylord Hauser, who is shown at the right.

Tubes containing acids found in the body make up the digestive system of the chemical man. The effect of various foods on the stomach and visceral organs is thus clearly shown. Through this means a proper diet, consisting of food that is going to be digested with the least effort and best effect, may be made out.

AFFORDS HEAVIER TOUCH

HUSTON RAY, noted pianist, shows Mona Rico, film star, his new wrist strengthener. Two bags weighing six pounds each are suspended from Miss Rico's wrists to give added strength to her touch.

The weights exercise the wrists and finger muscles and permit a heavier bang on the ivories when forte music is called for.

FIND ANCIENT TRACKS

DINOSAURS larger than freight trains and twice as powerful once romped all over Naugatuck valley in Connecticut, according to Yale scientists.

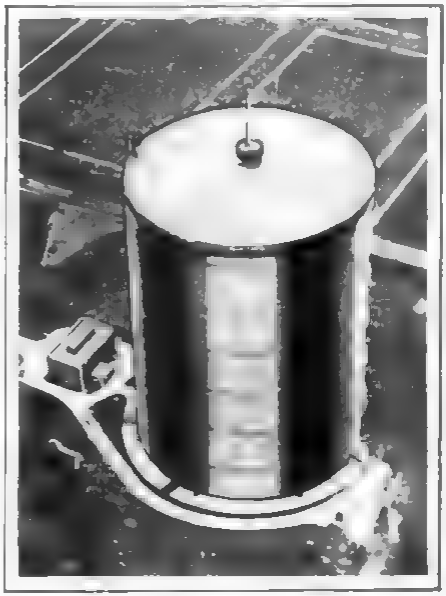
Recent discovery of footprints in North Branford, Meriden, Ansonia and other valley points have convinced investigators that this district was the center of a thriving community of pre-historic monsters about 10,000,000 years ago.

One of the prints is believed to be that of an amphibian, of which trace has been found only once before on the North American continent.

FLIERS' GUIDE TO AIRPORT

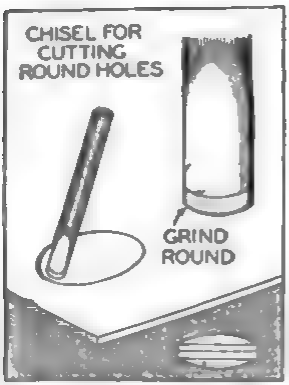
THE WORLD'S largest gasoline container, located in Chicago, Ill., serves a dual purpose. In addition to having a capacity of 20,000,000 cubic feet of gas, it is also the first comparable industrial structure in the country to be marked and lighted according to specifications approved by federal and local aviation authorities.

The container is 283 feet in diameter and 416 feet from the ground.



Letters 30 feet high tell the story.

Items to Interest the Home Mechanic



SPECIAL CHISEL CUTS ROUND HOLE

THERE are many times in a shop when the requirement of a hole of round, semi circular, or elliptical shape calls for the making of special tools to do the trick in the right way. Often, particularly with sheet metal, such holes are hard to cut with the tin shears.

One way of working the sheet metal is with the round-ground cold chisel shown in the drawing.

The chisel is ground with the usual V edge, but instead of being ground straight across, it is held in one position and the cutting edge swung on a stone to produce the rounded sweep of the cutting lip.

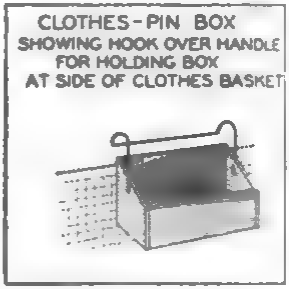
Such a tool will cut clean, circular holes in sheet metal of any thickness.

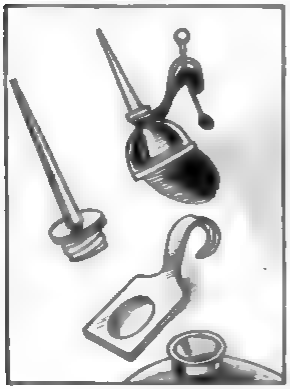
A HANDY CLOTHES PIN BOX

A CLOTHES pin box built after the idea illustrated will be a welcome addition to the housewife's wash day equipment.

The handle is made of heavy wire shaped after the hook-over plan as shown, so that the box may be hung at the side or end of the clothes basket.

Inasmuch as one side of the box is higher than the other, thereby making it the heavier, the position of the holes where the handle penetrates the ends of the box must be found by experimentation so that the box may be carried without tipping.





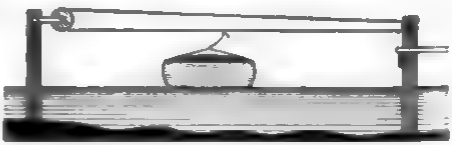
ATTACHMENT TO HANG UP OIL CAN

OIL CANS are probably the most needed and yet abused pieces of equipment in the average garage or machine shop. They seem to be always missing, empty or broken. There seems to be only one sure way to keep this important tool in first class shape. Hang it on the wall.

Take a piece of heavy gage sheet iron and fashion a spoon similar to that shown in the figure to the left. Cut a hole in the spoon so that it will fit closely over the screw of the oil can. Bend a hook in the other end as is shown. Replace the top of the can and the spoon attachment then becomes a permanent hanger for the elusive container of lubricant.

METHOD FOR TYING A BOAT AT THE PIER

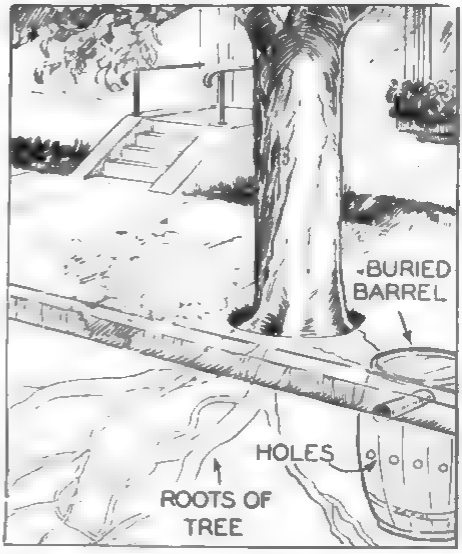
A HEAVY stake or post is driven at the desired distance from the end of the pier. A swivel pulley is fastened to the post and a length of rope run through it so as to form an endless belt. This boat is tied to a ring in the rope and run out to a point midway between the stake and pier.

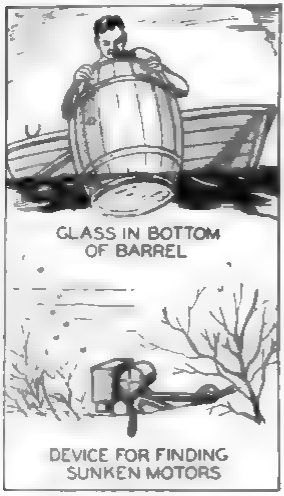


Simple Devices You Will Find Useful

WATERING TREES UNDER A SIDEWALK

WHEN a new sidewalk is surveyed through growing sections of a city, it is sometimes necessary to cut away a section of the concrete to permit a fine shade tree to project through the sidewalk. If the street is paved, however, the tree will eventually die because no water reaches its roots, the concrete proving an effective barrier to moisture. An effective way to water such trees without ruining the sidewalk is shown in the sketch at the right. A barrel is buried underground, a pipe leads from it to the gutter, where waste water is collected and distributed to the surrounding soil through vents in the barrel staves, furnishing ample moisture to the tree roots.



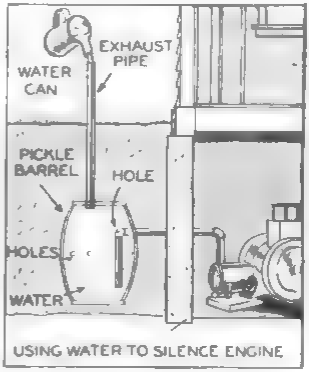


RECOVERING A SUNKEN MOTOR

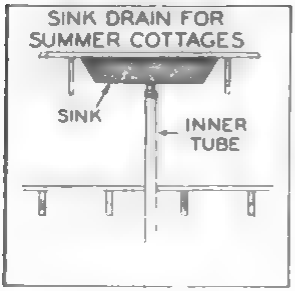
WHEN the outboard motor drops off the boat, as sometimes happens, it is a long and tedious task to locate the spot where it has sunk by grappling or diving. An easy method of locating the motor is provided by the use of an ordinary barrel, to which a piece of glass is fitted at the bottom, making a sort of inverted periscope. Place the glass bottom of the barrel beneath the surface and it will be found that a remarkably clear view of the bottom is obtained, since the surface waves do not obscure clear vision. The barrel finder can of course be employed for other purposes, such as studying the vegetation at the bottom of lakes, or finding other lost articles.

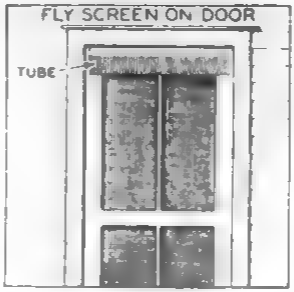
WATER AS AN ENGINE MUFFLER

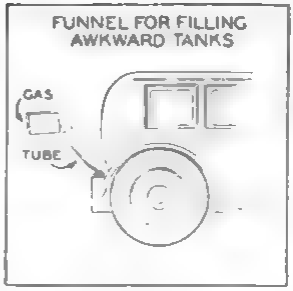
FARM homes operating their own lighting plants will find the water engine muffler diagrammed at the right remarkably effective in quieting the sound of the gasoline motor. It is simply constructed. Dig a hole for the barrel and run the exhaust pipe from the engine into it, boring holes half way up from the bottom so that the water will seep out into the ground without backing up into the engine. Run an exhaust pipe from the top of the barrel as shown. This pipe should project about a yard above the ground, as otherwise the exhaust smoke will turn the grass black. Drill a little pin hole in the elbow of the exhaust where it enters the barrel; this is to prevent water being sucked into the engine when the gas in the line contracts as it cools.



Six New Uses for Old Inner Tubes







WHEN an old inner tube goes to pieces so that it is no longer capable of holding air, it is usually thrown on the junk pile or given to Johnny to be cut into strips for slingshots. The old tube, however, is usually as good as new except at the spot where the damage was suffered, and it can profitably be put to a number of uses, half a dozen of which are suggested on this page.

Most summer cottages in the woods are provided with sinks which do not possess drain pipes, owing to the expense of installing metal plumbing. An old inner tube, attached as shown in the above diagram, serves efficiently to carry off the waste water beneath the floor of the cottage.

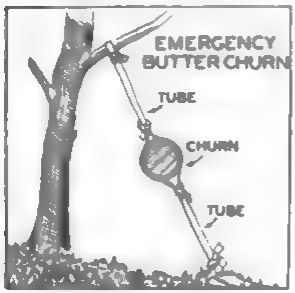
Fly "shooers" for screen doors afford another use for discarded tubes, just as practical for the city home as the lake cottage. Take the old tube, slice it so that it lies flat, and then cut it into fringes as shown in the center illustration above. An ordinary pair of scissors will be found satisfactory for this purpose. When tacked in place along the solid edge, the fringe lapping over the top of the door frame, the inner tube will be found to serve its purpose satisfactorily.

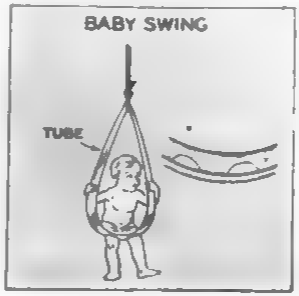
Many gasoline tanks, even on latest model cars, are awkward to reach when one is forced to pour in the gas from a one-gallon can, as is frequently the case when the tank runs dry unexpectedly and an emergency supply must be obtained. A length of inner tube will make an excellent funnel so that none of the precious gasoline is lost in transferring it from can to tank.

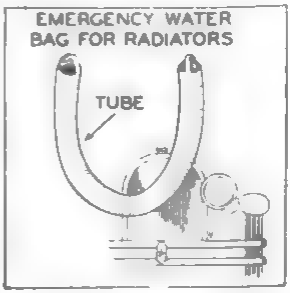
Another indication of the wisdom of carrying an old tube in the car's tool kit may be found when the radiator boils dry. Ditches along the road usually contain an ample supply of rain water, but it is difficult to transfer unless one has an emergency water bag similar to the one shown in the sketch below with which to scoop it up.

An excellent baby swing can be made from an inner tube. Simply cut apertures for the youngster's legs, as shown in the drawing, add a spreader bar, tie the tube to a tree branch with a stout rope, and it is ready for use.

Inner tubes have even been used to churn butter! Note the arrangement shown below, in which the churn is suspended in the air between two lengths of inner tube. It is a simple matter to keep the contents of the churn sloshing about until the butter is made.





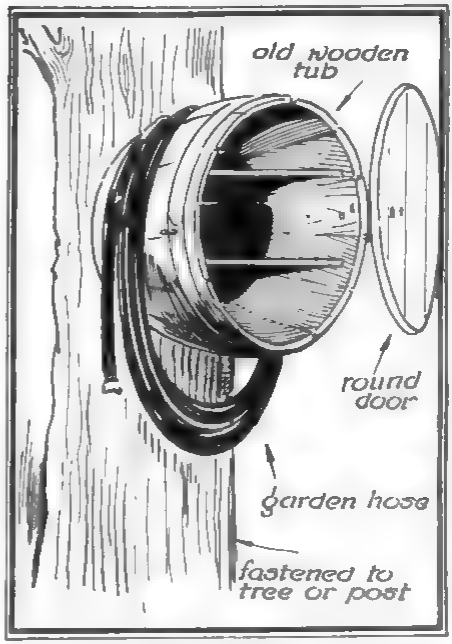


For the Gardener and Home Maker

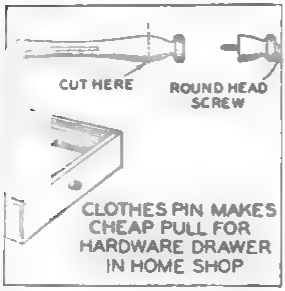
A GARDEN CHEST

HERE is an excellent chest for the garden. Although you may have a place in the basement or garage for permanently storing tools and equipment, it is not always convenient to go there for articles which are frequently used. This chest has shelves inside for many small items and the garden hose can be coiled and slipped over the outside. Since the bottom of the tub is nailed to the tree, post, or side of a building, the hose cannot slip off as the sides slope to the rear.

A wooden tub can be used, or you can cut a vinegar barrel in two and use one half. Cut shelves to fit, slightly shorter than across the chest at the widest point. Force the board in place and nail, then turn over and nail the other shelf solid. You can use a large strap hinge for the door, which is made of boards with a cleat on the outside both above and below the center. This door can be omitted if desired.



CLOTHESPIN HEAD MAKES GOOD DRAWER PULL



A CHEAP pull for the hardware drawer in the home workshop can be easily and quickly made by cutting off the head of a clothespin about half an inch from the top, as shown in the drawing. Drive a screw through the center of the pin and fasten it to the front of the drawer. A coat of paint over the knob finishes up a very workmanlike job. The clothespin pull presents a much more finished appearance than the half section of a spool which is often pressed into makeshift service in an emergency. In the case of a wide drawer, two pulls can be used to advantage.

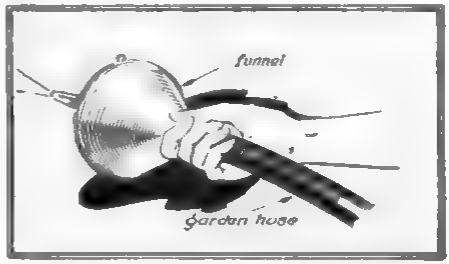
FIREPROOFING

A combination of water glass, or soluble glass, and tungstate of soda is commonly employed in fire proofing fabrics or wood.

FUNNEL IS SPRAY SHIELD ON GARDEN HOSE

AN OLD funnel, if placed over the end of the garden hose just back of the nozzle, will prevent wet arms and clothes. Remove the neck and enlarge the hole just enough to permit pulling the hose through.

To insure a tight fit and prevent water running down the hose, center funnel, then drip some melted wax down around the hose on all sides to build up a wax plug two or three inches long. This plan is particularly good for use with the hose when spraying water on the flowers, in the garden, or cleaning the sides of the house in hot weather.



Edited by WALTER D. KERST

As an Associate Member of the Society of Motion Picture Engineers, Mr. Kerst is nationally known as an expert on the technical aspects of movie making. This department is a regular monthly feature of Modern Mechanics, showing home movie makers how to get the best effects from their machines.

Make Your Own Home Movie Subtitles!

ANY amateur will find it fascinating fun to make his own titles for the pictures he shoots. The materials needed for the various types of titles are as follows:

1. Black cardboard of good grade, even in tone, and really "black" (many so-called blacks are dark gray), or,

2. Title boards, with grooves into which celluloid letters are fitted.

3. Celluloid letters, procured through your dealer. These are fairly expensive, but can be used again and again.

4. Gummed white paper letters. These are pasted on the black cardboard and cannot be used again. Procurable at most stationery stores.

5. A good white ink or paint, applied with pen or brush makes an excellent title if you are good at lettering; be sure letters are opaque in order to get a good white. (Johnson's Snow White Ink is ideal.)

6. Borders around titles; admits of many variations; material used—brush white paint or ink.

This home made title effect was obtained by making an enlargement from a small pocket-camera negative and lettering in the wording.

Art Titles

1. Photograph used as background for titles; have a photograph dark enough so that white letters can be read easily.

2. Pastel drawing used as background; gives very soft tones on film; suggests atmosphere of the picture.

3. Cartoon drawing; for comedy titles; help tell the story.

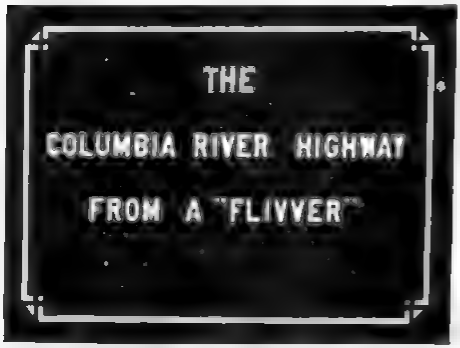
4. Animated title; this can be done with many objects: dolls, letters, cartoon figures, etc.—makes a novel title.

5. Moving title; this is used when there are too many words in a title to go in the given space. After the first lines of the title are on the screen long enough to be read, the title moves slowly upward, bringing the remaining lines in view.

It is advisable to build a stand for the camera and easel which holds the title

card, for this will insure quick set-up and accuracy. Take a piece of board about 12 inches wide and 4 feet long. On one end nail a small wood cleat across the board so that the camera can be placed flush up against it. Also center the camera lens exactly in the center of the board. Down the sides of the board, about an inch in from the edge, nail two more wood cleats to serve as guides or tracks for the title card easel. A bread board or a drawing board will make an excellent title card holder. This easel should have two cleats nailed to the back so that when it is placed inside the guide strips, it will stand upright and can be moved forward or backward. Be sure that the easel is absolutely parallel to the lens of the camera, both vertically and horizontally. If it is not, your titles will photograph out of focus and be blurry on the screen.

Titles are shot the same as regular pictures. If you have a camera that operates at half speed, or eight pictures a second, take advantage of this speed and you will be able to stop your lens down more and get sharper titles. Titles may be photographed indoors or out. If your card is in bright sunlight, use stop f. 16. This will give you a very sharp definition on the screen.



This title is made by pasting gummed white paper letters on a black background, and is perhaps the type of title most easily made by the amateur. The white border is drawn by hand.

Another interesting hand lettered effect, using a movie "still" as a background. This type of shot is much used by professionals.

When shooting indoors in artificial light *never* use a stop larger than f. 5.6 or your titles will be blurry. A stop of f. 8 can be used with 1,000 watts of lights in two units of 500 watts each, each light to be placed 12 inches to the side of the card and 12 inches in front of it. To determine the number of feet to shoot on a given title, start reading the title out loud when you press the button, reading slightly slower than normal, and release the button when finished reading. The distance the lens should be from the title card on the easel, depends on the focal length of the lens and the type of camera used. These directions are contained in the instruction book packed with each camera.

It's a lot of fun making your own titles, and besides, it enables you to say that your film is entirely your own work, from start to finish. As you progress, novel ideas for titles will occur to you, and you will agree that a well-made title helps to dress up any film.

ANIMATED MOVIES LEND INTEREST TO HOME SCREENS

NO DOUBT all readers of this department have seen in their local theatres movies in which dolls, toy animals, and so forth carry out the story of drama or comedy. This highly interesting form of movie making can also be done by the amateur cameraman, and although it takes a great deal of patience and careful application to details, the results are very much worth while.

This form of movie animation may be done either outdoors in natural light, or indoors in artificial light. The latter is preferable, for the light source is constant, and hence exposure will be more even on scenes that must be in sequence in the finished film, but which for certain reasons must be photographed at different times for sake of convenience while making the film. Miniature sets to represent exteriors can be built

Camera Swing Used in Photographing Difficult Ship-Side Shots

All sorts of makeshifts must be resorted to by cameramen filming the big movie spectacles. In this instance a special swing has been suspended alongside a ship in order to get a view of a diver coming up from the depths under the ship's stern. Note the reflector in the corner.

indoors on a table. Of course, this is more difficult than working outdoors on the ground where grass, dirt and foliage are all ready for a natural setting.

Briefly, the method of making an animated doll picture is as follows: Assume that the first scene is an interior of Laura Doll's house and her sweetheart Jim is calling on her. The furniture, to scale with the dolls, which can either be made or purchased at little cost, is arranged properly on the miniature "set." A cardboard box of proper size can be used for the walls and ceiling of the room, and painted to show any desired wall finish. The doors and windows are cut in the cardboard. The "set" may be crude or elaborate, depending on the skill of the individual. The lighting of the scene comes next. Two 500 watt Mazda T-type projection bulbs in suitable reflectors are placed at each corner of the set. If a backlighting effect is desired, one or two more lights may be used. These are placed above and in back of the set, facing the camera, turning them downwards so that none of the rays will reach the lens of the camera.

The camera *must* be used on a tripod. For making a long photoplay it will be necessary to leave the camera in place for days at a time.

Now comes the actual taking of the first scene. Suppose that the first bit of action in this particular scene is that of Jim entering the room and Laura Doll rising from the sofa and embracing him. Animated pictures are made in "stop motion," or a "one to one" movement of the film. This simply means that for every turn of the crank or pressure of the starting button one frame of film is exposed instead of the usual eight frames. In order to expose one or two frames of film in the motor driven cameras, the button must be merely touched lightly and released immediately. But let's return to the scene.

A few feet of film is made of the set with Laura Doll seated on the sofa reading a magazine. This is shot in the usual manner. Next a door on the right with a hand (the hand of Jim) is seen opening. Jim is placed outside the door with his hand on the knob, the door opened slightly. One frame of this is photographed. Next, the door is opened a quarter of an inch or so more (depending on the scale of the set and the speed with which it is desired to have the doll move), and another frame photographed. This is continued until the action of Jim Dolly opening the door and entering the room is completed.

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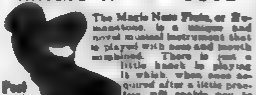
STAGE MONEY

With a bunch of these bills, it is easy for each person of limited means to appear prosperous by flashing a roll of these bills at the proper time and peeling off a genuine bill or two from the outside of the roll, the effect created will be found to be all that can be desired. Prices, postpaid: 40 Bills 20c, 120 for 50c, or $2.50 thousand postpaid.

MAGIC NOSE FLUTE



Pad Pad 10c

The Magic Nose Flute, or Zomanstone, is a unique and novel musical instrument that is played with nose and mouth combined. There is just a little knack in playing it which, when once acquired after a little practice will enable you to produce very sweet musical effects that resemble a flute. Thrilling to an Beginning, and once you have mastering it you can play all kinds of tunes with facility and ease. When played as an accompaniment to a piano or any other musical instrument, the effect is as charming as it is surprising.

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Well made and effective, made after an old fashioned type of Revolver; appearance alone is enough to scare a burglar. When loaded it may be as effective as a real revolver without danger to life. It takes standard .32 Cal. Blank Cartridges—obtainable everywhere. Special introductory order offer: 1 Superior quality Blank Cartridge Pistol, 100 Blank Cartridges, and our new 1920 page Fun Loss Catalog of latest novelties; all for ONLY $1.50. Shipped by Express only. Cannot go by parcel post. Extra Blank Cartridges 50c per 100. Special Holster (Cowboy Type) for pistol $2c. No C O D shipments.

LOOK 35¢ LOOK Wonderful Instrument.

Greatest thing yet. Nine separate articles in one. Everybody delighted with it. Odd, Curious and Interesting. Lots of pleasure as well as very useful. It is a double Microscope for examining the wonders of nature. It is also an Opera Glass, a Stereoscope, a Burning Lens, a Reading Glass, a Telescope, a Compass, a pocket Mirror, and a Laryngascope—for examining eye, ear, nose and throat. It is worth all the cost to locate even one painful cinder in the eye. Folds flat and fits the pocket. Something great—you need one. Don't miss it. Sent by mail Only 35c or 2 for 60c postpaid.

JOHNSON SMITH & CO., DEPT. 981, RACINE.

PISTOL, OPERA AND FIELD GLASS

9 In One

It is made in the shape of and looks like a regular Automatic Pistol. No one is likely to stop and ask you whether it is real or not. They it is likely to prove itself very handy in an emergency. On pressing the trigger it opens up as shown in the illustration at the right, revealing nine in all useful articles—Opera and Field Glass, Telescope, Mirror, Magnifying Glass and Burning Lens, Reading Glass, Sun Dial, Sun Compass, etc. In the handle of the revolver there is a place for various pocket necessaries, such as First Aid Articles, Buttons, Pins, etc. The Pistol is of sheet metal, blued finish, that will be carried readily in pocket. PRICE $1.00 postpaid.

Watch Charm Pistol

$1.75

REAL PISTOL

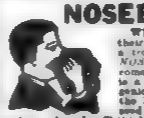
Exact reproduction in real pocket pistol, using REAL BLANK CARTRIDGES of 22 calibre rim. Illustration is actual size. Metal throughout, with ring at end for attaching to watch chain. Loads [illegible] regular pistol. Pull the trigger and it goes off with a loud bang. Pistol is brush open type, illustrations shown position for loading. Made entirely of high grade steel, nickel plated, barrel hardened and tempered. Each complete in box with cleaning rod. PRICE $1.75. Also furnished with pearl handles, $2.50. BLANK CARTRIDGES, 50c per box of 25. JOHNSON SMITH & CO., Dept. 981 RACINE, WIS.

Wonderful X-Ray Tube

10¢

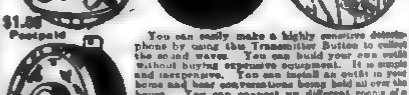
A wonderful little instrument producing optical illusions both surprising and startling. With it you can see what is apparently the bones of [illegible] hands, the lead in a lead pencil, the metal [illegible] running in a pipe stem and many other similar illusions. A mystery that no one has been able to satisfactorily explain. Price 10c, 3 for 25c, 1 dozen 75c. Johnson Smith & Co.

NOSEBLOWER



When some man blows these noses it sounds like a trombone. Now the NOSE BLOWER has come to torment us. It is a startler! It is ingeniously concealed in the handkerchief. Proceed to blow your nose and your friends will think they heard a goose or cow or something. You can blame it on your darling's very bad cold and keep up the fun so long as you like. PRICE 10c, 3 for 25c, or 75c doz. postpaid.

MICROPHONE TRANSMITTER OUTFIT



$1.00 Postpaid

You can easily make a highly sensitive detective phone by using the Transmitter Button as shown in the sound view. You can build your own outfit without buying expensive equipment. It is simple and inexpensive. You can install an outfit in your home and have conversations from room to room all over the house. You can connect up different rooms of a hotel. This outfit was used by secret service operatives during the war to locate hand to the stage. It is ultra-sensitive and is the greatest invention in micro-phones. You can mount the button on wood, metal, paper-board, cardboard, brass, pipes, stiff celluloids, or on the wall behind a picture frame, etc. Button is so light and small it cannot be detected. Can be used in a home hold

BOYS! BOYS! BOYS!
Throw Your Voice

Into a trunk, under the bed, under a table, back of the door, into a desk at school, or anywhere. You get lots of fun fooling the teacher, policemen, peddlers, and surprise and fool all your friends besides.

THE VENTRILO

is a little instrument that fits in the mouth out of sight. Cannot be detected. It is used in connection with the above, and with the aid of this wonderful **DOUBLE THROAT, or VENTRILO**, you can imitate many kinds of birds, animals, etc. Remember you get everything for ONLY TEN CENTS—a booklet giving you full instructions how to become a ventriloquist and throw your voice, the **Double Throat**, or **Ventrilo**, and our big 600 page catalog of novelties, tricks, puzzles, masks, books, etc., ALL SENT POSTPAID TO ANY ADDRESS FOR ONLY **10 cents**

LEARN TO PITCH

By the world's greatest pitchers. Prepares you mentally, morally and physically to become a great baseball player and a great athlete. Special course of lessons by **CHRISTY MATHEWSON**, who explains the secret of how to throw the great **"FADEAWAY"** ball, so much feared by the great batters; **ED WALSH**, the pitcher who discovered the secret of throwing that famous, mystifying, and unhittable **"SPIT BALL"**; **JOE WOOD**, the **"Smoke Ball"** marvel, next to the speediest pitcher in the world, **WALTER JOHNSON**, the man who has struck out more league batters in a single season than any other pitcher known, **NAP RUCKER**, inventor of the **"Knuckle Ball"**, and **DOC WHITE**, who teaches you the art of **Shadow Pitching** by which you can develop control and speed necessary to become a star pitcher. Clearly described and illustrated by 58 pictures. Everything complete for **ONLY 25 cents postpaid anywhere.** Nothing more to buy

MAGICIAN'S BOX OF TRICKS

Apparatus and Directions for a Number of Mysterious Tricks, Enough for an Entire Evening's Entertainment $1.00

BY ANYONE CAN DO THEM

It is great fun mystifying your friends. Get the Conjurer's Cabinet, and you will be the cleverest fellow in your district. It contains the apparatus for two famous tricks, namely: The MAGIC BALL AND VASE TRICK (a wooden ball is placed inside, and upon replacing the lid has disappeared and is found in someone else's pocket. The HINDOO TRICK CARDS (can be made to change completely no less than five times). DISAPPEARING COIN BOX (a coin placed in the wooden box vanishes entirely or changes into a coin of another denomination). The GLASS GOBLET TRICK (a coin is dropped into a glass of water and when the water is poured out the coin has vanished and is found somewhere else). the RIBBON FACTORY FROM THE MOUTH TRICK (a seemingly endless supply of colored paper ribbons comes out of your mouth). the DISAPPEARING HANDKERCHIEF (a handkerchief held in the hand mysteriously vanishes), the WIZARD'S RING COIN TRICK, the ENCHANTED MATCH (no one but you can make it lay down). the GREAT HAT AND DICE TRICK (a large dice is placed on top of a hat, disappears, and is found underneath, yet no one has touched the hat), and last but not least the GREAT PHANTOM CARD TRICK (of two from five leaves nothing). Full instructions are sent for performing each trick. In addition to the above, a number of other tricks and illusions are fully explained for which you can easily make or procure the necessary apparatus. **Price complete $1.00 postpaid. JOHNSON SMITH & CO.**

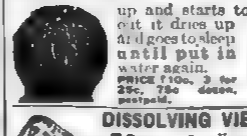
U. S. BABY TANK

It goes with real Yankee Pep—by its own power

Most remarkable toy ever invented. By drawing the Tank backward, either with the hand or over the floor or table and then placing it down, it will crawl along, overcoming all obstacles, in the same lifelike manner as the larger Tank that proved so deadly a the great war. What makes it go is somewhat of a mystery, for there is no mechanism to wind up as is usually understood with mechanical toys, yet this tank will keep plodding along ten times longer than the ordinary run of toys. It will perform no end of the most wonderful stunts; 3¼ inches long. Sent postpaid only 20c cresceid. Stamps accepted.

JOHNSON SMITH & CO.

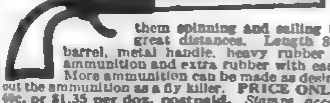
RESURRECTION PLANT



Great curiosity. Place in water, plant opens up and starts to grow in few minutes. Taken out it dries up and goes to sleep until put in water again.

PRICE 10c., 3 for 25c., 75c dozen, postpaid.

15c POSTPAID Card Sailer Pistol



It shoots small squares of cardboard, sending them spinning and sailing through the air to great distances. Length 8¾ inches. Wood barrel, metal handle, heavy rubber band. Plenty of ammunition and extra rubber with each gun in neat box. More ammunition can be made as desired. Can use without the ammunition as a fly killer. PRICE ONLY 15c each, 3 for 40c, or $1.35 per doz. postpaid. *Stamps accepted.*

JOHNSON SMITH & CO., Dept. 961, RACINE, WIS.

DISSOLVING VIEWS 50c

You may have a lot of fun with this little peep show. A regular miniature, elaborately constructed of metal, having a micro scopic lens fitted into one end. While the victim is absorbed in admiration of the pretty picture, and turns the button in the confident expectation of seeing something interesting, a spring syringe is brought into action and the observer experiences a very great surprise

Johnson Smith & Co., Dept. 961 Racine, Wis.

Comical Motto Rings

Lots of harmless fun and amusement wearing these rings. Made in platinoid finish (to resemble platinum), with wording on enameloid, as illustrated. **Price only 25c Postpaid.**

Great Fire Eater

A great trick by which you can apparently breathe fire from mouth, to the horror and consternation of all. Quite harmless. All apparatus necessary sent complete in box for ONLY 30c., p. pd. JOHNSON SMITH

SQUIRT ROSE 25c

A REAL STARTLER. This is the most popular of all magic tricks. A flower in your coat looks so fresh and sweet that everyone is tempted to inhale the delightful perfume. Then is the moment to press the bulb. Carnation squirts. Don't they jump? There is a very long rubber tube that easily reaches to the pocket of your coat or trousers, and the bulb is large enough to make a dozen shots with one loading. PRICE 25c each, or 2 for 40c postpaid.

SEEBACKROSCOPE

Place this clever instrument to your eye, you see what is going on behind your back. Very interesting things occur when no one thinks you are looking. Just like having eyes at the back of your head. PRICE 25c POSTPAID

The "Little Giant" Typewriter

A First Class Writing Machine For $1.50

A perfect little typewriter for $1.50. There are thousands of persons who would like to have a typewriter but whose needs and business do not warrant the expense attached to the purchase and use of a fifty or seventy-dollar machine. To such persons we confidently recommend our Little Giant. It is strongly made, but simple in construction, so that anyone can quickly learn to operate it, and write as rapidly as they would with pen and ink. The letters of the alphabet, most frequently used are so grouped as to enable one to write rapidly, the numerals 1 to 10 and the punctuation marks being together. With this machine you can send your best and prettiest love letters, address envelopes, make out bills, and do almost any kind of work not requiring a large, expensive machine. With each typewriter we send a tube of ink and full printed instructions for using the machine. Price complete $1.50 by mail postpaid to any address in the world.

Send remittance (Postage Stamps accepted) for all articles listed above also in our other ad on previous page

JOHNSON SMITH & CO. Dept. 961 Racine, Wis.

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You may now have any Wurlitzer instrument for an ample trial in your own home. Examine the instrument, note the fine workmanship, the full rich tone value and especially how easy it is to play. No obligation to buy—no expense for the trial. We make this liberal offer because we want you to try for yourself a genuine Wurlitzer instrument, the result of 200 years experience in musical instrument building. Easy payments are arranged to suit your convenience. This is your opportunity to try a famous Wurlitzer instrument in your own home. Send for

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Carter of the Red Planet

(Continued from Page 123)

sonably assured that the ships would not return; for to be caught on the open plains with a cavalcade of chariots and children was far from the desire of even so warlike a people as the green Martians.

During our period of inactivity, Tars Tarkas had instructed me in many of the customs and arts of war familiar to the Tharks, including lessons in riding and guiding the great beasts which bore the warriors. These creatures, which are known as thoats, are as dangerous and vicious as their masters, but when once subdued are sufficiently tractable for the purposes of the green Martians.

My experience with Woola determined me to attempt the experiment of kindness in my treatment of my thoats. First I taught them that they could not unseat me, and even rapped them sharply between the ears to impress upon them my authority and mastery. Then, by degrees, I won their confidence in much the same manner as I had adopted countless times with my many mundane mounts.

In the course of a few days my thoats were the wonder of the entire community. They would follow me like dogs, rubbing their great snouts against my body in awkward evidence of affection, and respond to my every command with an alacrity and docility which caused the Martian warriors to ascribe to me the possession of some earthly power unknown on Mars.

On the seventh day following the battle with the air craft we again took up the march toward Thark, all probability of another attack being deemed remote by Lorquas Ptomel.

On the evening before our departure I saw Sola and Dejah approaching along one of the great avenues which lead into the plaza from the east. I advanced to meet them, and telling Sola that I would take the responsibility of Dejah Thoris' safe keeping, I directed her to return to her quarters on some trivial errand.

"They have had me down in the pits below the buildings helping them mix their awful radium powder," said Dejah Thoris, "and make their terrible projectiles. You know that these have to be manufactured by artificial light, as exposure to sunlight always results in an explosion. You have noticed that their bullets explode when they

Win $2000

and NEW HUDSON COACH!

Find The Key That Opens The Treasure Chest

Many people have become wealthy almost overnight by the discovery of hidden treasures. Here is an opportunity for you to experience the thrills of a treasure hunt and receive $2,000.00 in CASH and a brand new HUDSON COACH. All you need is a sharp eye to discover the right key which may lead you to the treasure of $2,000.00 in CASH and also a brand new *Hudson Coach* for promptness.

Auto Goes for Promptness Winner Gets CASH and AUTO BOTH

15 Other Cash Prizes

There are hundreds of dollars in these other cash prizes besides the $2,000.00 CASH first prize and the new HUDSON COACH for promptness. In addition, if you take an active part in this contest, you will receive $1.25 worth of our products FREE. If your eyes are sharp enough, you may win the $2,000.00 CASH first prize and the new HUDSON COACH, too, for promptness, if on time—or if you prefer, $3,400.00 in all.

THIS IS NOT A MAGAZINE CONTEST

Some Person with a Sharp Eye is Going to Win

If you find the lucky key, you may win. You do not have to buy or sell any magazines to win any of the 16 big CASH prizes. Neither is it necessary to sell anything. We are offering these prizes to quickly advertise the name and products of the Paris-American Pharmacal Company. To make them better known, we are dividing our profits and absolutely giving away the $2,000.00 CASH first prize. 15 other CASH prizes and in addition a new HUDSON COACH for promptness. What's still more—we will reward hundreds of others with $1.25 worth of our products and duplicate prizes will be given on all awards in case of final ties.

PARIS-AMERICAN PHARMACAL CO.,
Dept. 220-B Fifth and Court Ave., Des Moines, Iowa

Here is a treasure chest and ten keys, one of which will open the lock. Find the right key and find it quick. Make the $2,000.00 yours and get the HUDSON COACH, too, for promptness. There's too much at stake for you to delay a minute. These keys are all the same size and apparently are exactly alike. If your eyes are sharp and you look closely you may find a key different from the other nine. The top, the bottom, the shaft, the notches or anything else is likely to be the point of difference. If you find the right key, it may mean $2,000.00 in CASH to you.

If you find the Right Key, mark it with an "X" and Mail This Ad Quick

Put an "X" on the key right away if you find it. Cut out this ad and rush it to us at once. Be quick—because the first prize winner, if on time, gets the $2,000.00 CASH and a new HUDSON COACH, too—or $3,400.00 in all. If you win the $2,000.00 CASH first prize you will want the new HUDSON COACH. Send your answer TODAY. We will let you know at once how close you are to winning, how to get the $2,000 first prize and make the new HUDSON COACH yours. There will be no delay in giving you your award for solving this puzzle, so mail your answer at ONCE.

Carter of the Red Planet

strike an object? Well, the opaque, outer coating is broken by the impact, exposing a glass cylinder, almost solid, in the forward end of which is a minute particle of radium powder. The moment the sunlight, even though diffused, strikes this powder it explodes with a violence which nothing can withstand. If you ever witness a night battle you will note the absence of these explosions, while the morning following the battle will be filled at sunrise with the sharp detonations of exploding missiles fired the preceding night. As a rule, however, non-exploding projectiles are used at night."

While I was much interested in Dejah Thoris' explanation of this wonderful adjunct to Martian warfare, I was more concerned by the immediate problem of their treatment of her. That they were keeping her away from me was not a matter for surprise, but that they should subject her to dangerous and arduous labor filled me with rage.

"Have they ever subjected you to cruelty and ignominy, Dejah Thoris?" I asked, feeling the hot blood of my fighting ancestors leap in my veins as I awaited her reply.

"Only in little ways, John Carter," she answered. "Nothing that can harm me outside my pride. They know that I am the daughter of ten thousand jeddaks, that I trace my ancestry straight back without a break to the builder of the first great waterway, and they, who do not even know their own mothers, are jealous of me."

The chill of the Martian night was upon us, and removing my silks I threw them across the shoulders of Dejah Thoris. As my arm rested for an instant upon her I felt a thrill pass through every fiber of my being such as contact with no other mortal had ever produced; and it seemed to me that she had leaned slightly toward me, but of that I was not sure. Only I knew that as my arm rested there across her shoulders longer than the act of adjusting the silk required she did not draw away, nor did she speak. And so, in silence, we walked the surface of a dying world, but in the breast of one of us at least had been born that which is ever oldest, yet ever new.

The morning of our departure for Thark dawned clear and hot, as do all Martian mornings except for the six weeks when the snow melts at the poles.

I GUARANTEE NEW HAIR *in These Three Places—*

OR DON'T PAY ME A CENT!

ARE you sincerely anxious to be done with dandruff, itchy scalp, falling hair and baldness? Do you *really* want to grow new hair?

Perhaps you've *already* tried hard to overcome these afflictions. Perhaps you've put faith in barbershop "tips," and used all kinds of salves, massages, tonics, all with the same results . . . lots of trouble and expense but no relief!

Now, consider what *I* offer you. I GUARANTEE to grow new hair on your head—on the top, front or temples—IN 30 DAYS . . . or not one red penny of cost to you.

Isn't that a different story from those you've heard before? I don't say, "try my wonderful remedy—it grows hair!" I say, and I put it in *writing*, "I GUARANTEE to grow hair . . . or no cost!"

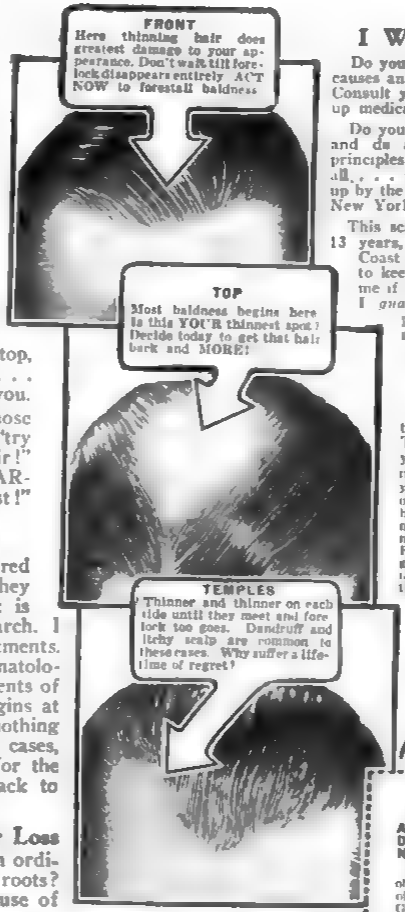
My Method Is Unique!

Thousands who formerly suffered from scalp troubles bless the day they heard of me. For my treatment is based on science, on years of research. I *studied scalps*, not how to sell treatments. And I found, as did leading dermatologists, that ordinary surface treatments of the scalp are futile. Baldness begins at the ROOTS. If roots are dead, nothing can grow new hair. But in most cases, roots are only *sleeping*, waiting for the right treatment to bring them back to healthy, normal life.

I Reach the *Cause* of Hair Loss

Now, I leave it to you. How can ordinary treatments penetrate to hair roots? How can they remove the *real* cause of baldness?

My treatment goes *below* the scalp, *right down towards the hair roots*, awakening them to new action. And with just the mere investment of a *few* minutes a day thousands get these results from my treatment . . . or they never pay a cent!



DANGER: One, two, three—BALD! And, perhaps total baldness, say leading dermatologists, if you neglect any one of the three places shown above. Thousands fail to heed the warnings. But there is hope, no matter how thin the hair. Read my message. Study my guarantee. Then ACT!

I Welcome Investigation

Do you want absolute proof of the true causes and proper treatment of baldness? Consult your family physician. Or look up medical reference books.

Do you want positive proof that I can and do apply these accepted scientific principles? I offer you the best proof of all, . . . my personal guarantee, backed up by the Meike Institute, Fifth Avenue, New York.

This scalp research bureau, established 13 years, is known to thousands from Coast to Coast. It has a reputation to keep up. It wouldn't dare to back me if I didn't tell the truth. So when I *guarantee* to grow hair or not a penny of cost, you're absolutely sure of a square deal.

Why Suffer Years of Regret?

Take a look in the mirror at those thin spots on your head! Think how you'll look when *all* your hair is gone. Consider how much prestige and attractiveness you'll lose. Then decide to act at once. Right now mail the coupon below for the FREE booklet giving my complete story. In it you'll find, not mere theories, but scientific FACTS and the details of my "hair grown or no pay" offer. My treatment can be used in any home where there is electricity. Send the coupon NOW! And by return mail the booklet is yours without the slightest obligation. Allied Meike Institutes, Inc., Dept. 2105, 512 Fifth Avenue, New York City.

MAIL IT *TODAY!*

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Please send me—without cost or obligation—in plain wrapper, copy of your book, "The New Way to Grow Hair," describing the Meike System.

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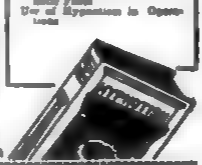
DON'T be unpopular, lonesome, or unhappy a minute longer. Now you can make your life what you want it to be—now you can win admiration, success and big money—through the strange power of hypnotism. I'll show you how to use this great force to help you master every situation or *The Five Day Trial is FREE!*

In just a few hours I'll teach you the hidden secrets of Hypnotism—the methods used by the great operators—the amazing things you can accomplish once you understand this mighty power. You can use it to overcome obstacles, achieve your fondest ambitions and become MASTER of yourself, friends and acquaintances—either sex. See for yourself how Hypnotism can banish fear, worry and opposition—improve your memory—increase your earnings—and *force* others to give you the good things in life you deserve!

In his startling NEW book, *The Science of Hypnotism*, the world famous hypnotist—Prof. L. E. Young—reveals the most carefully guarded secrets of this fascinating subject. He not only explains the methods of noted hypnotists, step by step—but tells clearly all about the nine stages of hypnotism, the Hypnotic Mirror, Mental Telepathy, how to select your subjects, magnetic healing, methods of hypnotizing, how to waken the subject, how to make money out of hypnotism!

Mysteries of Hypnotism Revealed

How to Hypnotize at a Glance
Susceptible Subjects
How to Hypnotize by Telephone
How to Give an Entertainment How to Make Others Obey You
Overcoming Bad Habits
How to do Dozens of Hypnotic Tests
Use of Hypnotism in Operation



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In accordance with our trial Prof. Young and his great book will quickly teach you the science of hypnotism, that we will send you a copy without your cost in advance! Simply clip and mail the coupon below. When the book arrives pay the postman the special low price of $2.98 plus few cents postage. Then test the powers of Hypnotism 5 days! If not amazed and delighted return the book and money will be refunded at once! Mail the coupon now.

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Please send me your amazing new book—*The Science of Hypnotism*—by Prof. Young. When the book arrives I'll pay the postman only $2.98 plus postage. If I am not satisfied after 5 days' trial, I may return the book and you are to refund my money.

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If you are likely to be out when postman calls, send $2.98 with coupon and we'll pay delivery charges. Customers outside U. S. must send cash with order.

Carter of the Red Planet

I sought out Dejah Thoris in the throng of departing chariots, but she turned her shoulder to me, and I could see the red blood mount to her cheek. With the foolish inconsistency of love I held my peace when I might have plead ignorance of the nature of my offense, or at least the gravity of it, and so have effected, at worst, a half conciliation.

My duty dictated that I must see that she was comfortable, and so I glanced into her chariot and rearranged her silks and furs. In doing so I noted with horror that she was heavily chained by one ankle to the side of the vehicle.

"What does this mean?" I cried, turning to Sola.

"Sarkoja thought it best," she answered, her face betokening her disapproval of the procedure.

Examining the manacles I saw that they fastened with a massive spring lock.

"Where is the key, Sola? Let me have it."

"Sarkoja wears it, John Carter," she answered.

I turned without further word and sought out Tars Tarkas, to whom I vehemently objected to the unnecessary humiliations and cruelties, as they seemed to my lover's eyes, that were being heaped upon Dejah Thoris.

"John Carter," he answered, "if ever you and Dejah Thoris escape the Tharks it will be upon this journey. We know that you will not go without her. You have shown yourself a mighty fighter, and we do not wish to manacle you, so we hold you both in the easiest way that will yet ensure security. I have spoken."

I saw the strength of his reasoning at a flash, and knew that it were futile to appeal from his decision, but I asked that the key be taken from Sarkoja and that she be directed to leave the prisoner alone in future.

"This much, Tars Tarkas, you may do for me in return for the friendship that, I must confess, I feel for you."

"Friendship?" he replied. "There is no such thing, John Carter; but have your will. I shall direct that Sarkoja cease to annoy the girl, and I myself will take the custody of the key."

As I was approaching Dejah Thoris' chariot I passed Sarkoja, and the black, venomous look she accorded me was the sweetest balm I had felt for many hours.

Fly to New Goals

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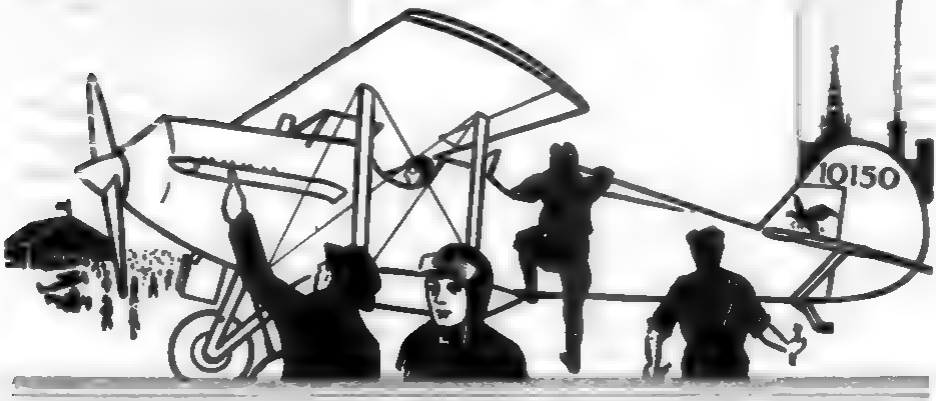

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Carter of the Red Planet

Lord, how she hated me! It bristled from her so palpably that one might almost have cut it with a sword.

A few moments later I saw her deep in conversation with a warrior named Zad; a big, hulking, powerful brute, but one who had never made a kill among his own chieftains.

We broke camp the next day at an early hour and marched with only a single halt until just before dark. Two incidents broke the tediousness of the march. About noon we espied far to our right what was evidently an incubator, and Lorquas Ptomel directed Tars Tarkas to investigate it.

Tars Tarkas dismounted and examined the inclosure minutely, finally announcing that it belonged to the green men of Warhoon and that the cement was scarcely dry where it had been walled up.

Shortly after the incident of the Warhoon eggs we halted to rest the animals, and it was during this halt that the second of the day's interesting episodes occurred. I was engaged in changing my riding clothes from one of my thoats to the other, for I divided the day's work between them, when Zad approached me, and without a word struck my animals a terrific blow with his long-sword.

I did not need a manual of green Martian etiquette to know what reply to make, for, in fact, I was so wild with anger that I could scarcely refrain from drawing my pistol and shooting him down for the brute he was; but he stood waiting with drawn long-sword, and my only choice was to draw my own and meet him in fair fight with his choice of weapons or a lesser one.

I chose the same weapon he had drawn because I knew he prided himself upon his ability with it, and I wished, if I worsted him at all, to do it with his own weapon.

Zad first attempted to rush me down as a bull might a wolf, but I was much too quick for him, and each time I side-stepped his rushes he would go lunging past me, only to receive a nick from my sword upon his arm or back. He was soon streaming blood from a half dozen minor wounds, but I could not obtain an opening to deliver an effective thrust. Then he changed his tactics, and fighting warily and with extreme dexterity, he tried to do by science what he was unable to do by brute strength.

We circled for some time without doing much damage on either side; the long, straight, needle-like swords flashing in the

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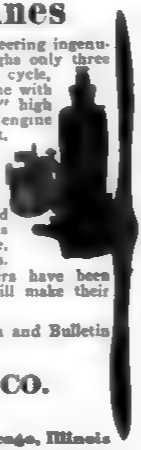

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Carter of the Red Planet

sunlight, and ringing out upon the stillness as they crashed together with each effective parry. Finally Zad, realizing that he was tiring more than I, evidently decided to close in and end the battle in a final blaze of glory for himself; just as he rushed me a blinding flash of light struck full in my eyes, so that I could not see his approach and could only leap blindly to one side in an effort to escape the mighty blade that it seemed I could already feel in my vitals.

I was only partially successful, as a sharp pain in my left shoulder attested, but in the sweep of my glance as I sought to again locate my adversary, a sight met my astonished gaze which paid me well for the wound the temporary blindness had caused me. There, upon Dejah Thoris' chariot stood three figures, for the purpose evidently of witnessing the encounter above the heads of the intervening Tharks. There were Dejah Thoris, Sola, and Sarkoja, and as my fleeting glance swept over them a little tableau was presented which will stand graven in my memory to the day of my death.

As I looked, Dejah Thoris turned upon Sarkoja with the fury of a young tigress and struck something from her upraised hand; something which flashed in the sunlight as it spun to the ground. Then I knew what had blinded me at that crucial moment of the fight, and how Sarkoja had found a way to kill me without herself delivering the final thrust. Another thing I saw, too, which almost lost my life for me then and there, for it took my mind for the fraction of an instant entirely from my antagonist; for, as Dejah Thoris struck the tiny mirror from her hand, Sarkoja, her face livid with hatred and baffled rage, whipped out her dagger and aimed a terrific blow at Dejah Thoris; and then Sola, our dear and faithful Sola, sprang between them; the last I saw was the great knife descending upon her shielding breast.

My enemy had recovered from his thrust and was making it extremely interesting for me, so I reluctantly gave my attention to the work in hand, but my mind was not upon the battle.

We rushed each other furiously time after time, 'til suddenly, feeling the sharp point of his sword at my breast in a thrust I could neither parry nor escape, I threw myself upon him with outstretched sword and with all the weight of my body, determined that

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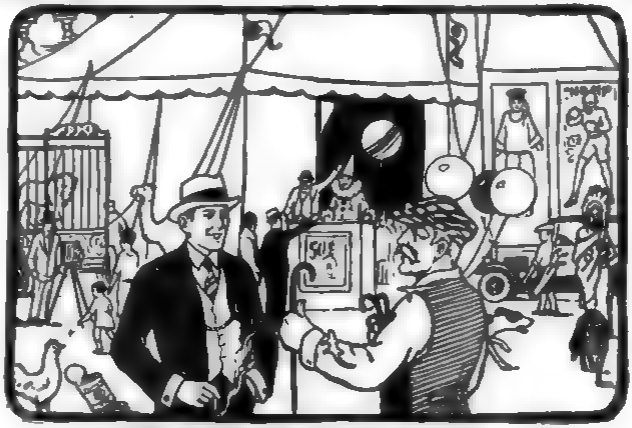

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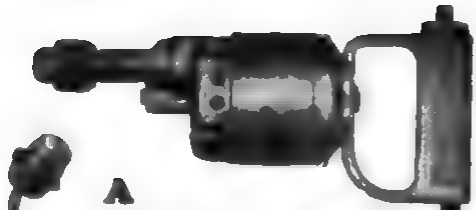

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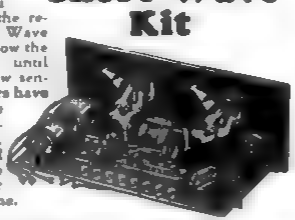

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Carter of the Red Planet

I would not die alone if I could prevent it. I felt the steel tear into my chest, all went black before me, my head whirled in dizziness, and I felt my knees giving beneath me.

How does Carter save himself in his fight with Zad? Follow the next chapters of this absorbing story in the June issue, on sale everywhere May first.

Building the Alco Sportplane

(Continued from Page 135)

the same length for each bay, since the bay is rectangular, without any sweepback. Square up the wing, get your lengths, and proceed as follows to make up your brace wires: First make a loop in one end of the wire, using a pair of very heavy pliers to do the work, or else bend the wire by using three nails driven in the bench as shown.

After the loops have been made, slip on a turnbuckle at that end, hold it there with a ferrule, and bend the point of the looped wire back over the ferrule; then slip a ferrule on the other end, get the proper measurement from the pin hole of the turnbuckle, (with about three threads of the turnbuckle showing at each end) to the new loop, then bend it around as before.

When all the wires are in and still loose, by sighting along the beams, and also measuring with a tape line from the corner of one bay to the corner of the other; in other words, when the diagonals of a rectangle are equal, the four angles are 90 degrees. Tighten the wires until they give a fairly high pitched tone when strummed with the fingers. When the wires are at the proper tension, and the wing checks for alignment,

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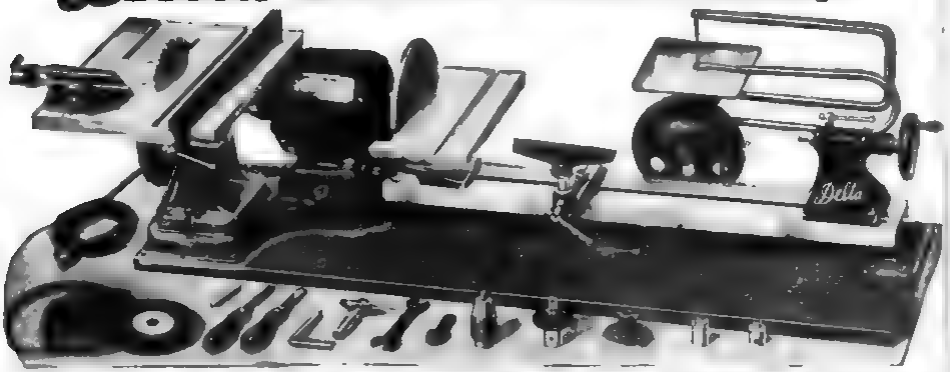

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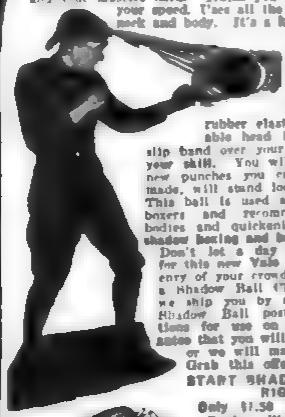

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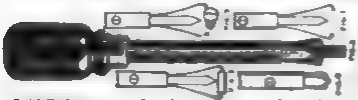

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Building the Alco Sportplane

safety all the turnbuckles with fine copper wire. Put on the steel tubing wing tip in the same way as shown in figure 5 for the aileron tip.

Installing the wing gas tank: With the Lawrance 28 horsepower engine, the carburetor is low, permitting the use of a fuselage tank, but with the Harley Davidson motorcycle engine, the carburetor is almost at the top of the cylinders, necessitating the use of a wing tank to afford gravity feed to the carburetor. The center section is not used because the thickness of the wing is used for head room. However, tanks may be installed in the wing on either side of the middle; the wires will not interfere unless the tank is made the full distance from front spar to rear spar. A good size would be 20 inches by 11 inches and conforming to the wing section; it can be made by your local tinner, using tin, galvanized iron, or copper; another possibility is welded sheet aluminum. Be sure to show the tinner a drawing of the full size wing section so that he can make a form around which to bend the sheet material. A Ford filler cap and outlet valve may be used for the fittings. There are two good ways to support the tank in the wing; the first is to use a plywood floor for it to rest upon; the second is to use a steel belly band $\frac{1}{20}$-inch thick, and one inch wide, with a strip of leather or felt between the tank and the strap, to take the wear.

On the plans, upper left corner, are shown the fittings for attaching the wing brace struts at the outer end. The fitting consists of two pieces made as shown from No. 13 gauge steel, held together with $\frac{1}{4}$-inch bolts going clear through the block in the wing spar.

The inner end of the wing brace strut attaches to the fuselage in the following manner: this end is flattened, then drilled for two $\frac{5}{16}$-inch bolts $1\frac{1}{2}$ inches apart; these bolts go through the steel tubing and also the end of the steel straps which pass through the slots shown in the front and rear landing gear sockets and project several inches. This strap runs clear through from one longeron to the other.

(To be continued next month.)

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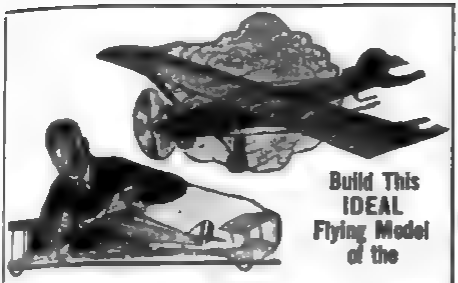

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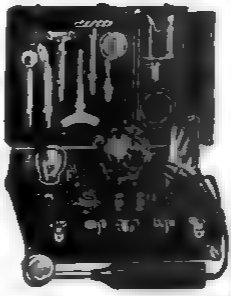

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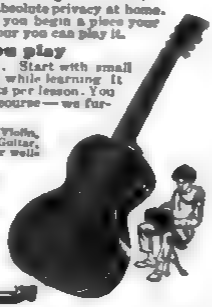

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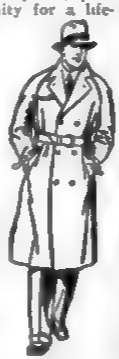

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◇ ◇ ◇

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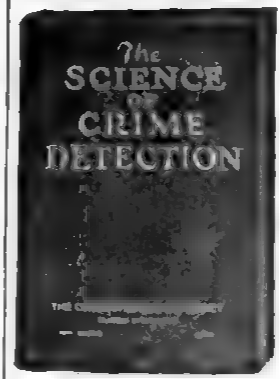

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LOT 1—Here are included many famous make radios. All have been thoroughly tested and are guaranteed to be in perfect condition. Can hardly be told from new. Formerly sold at very high prices..... **$14.90**

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As one of our customers you must be satisfied. If upon receipt of your set you do not feel that it is the biggest bargain you ever bought return the set and we will promptly refund your money. Could anything be more fair?

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Take advantage of these amazing values now! We ship promptly. Upon arrival pay price of set ordered plus a small delivery charge. (Foreign countries send Money Order with order.)

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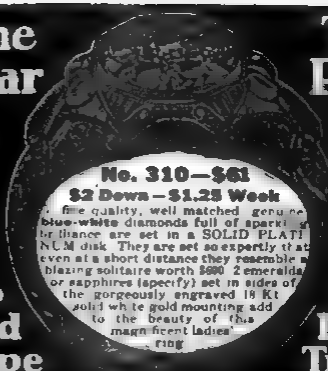
DEALERS IN BANKRUPT RADIO STOCKS

One Year To Pay



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$2 Down—$1.25 Week

A fine quality, well matched genuine blue-white diamonds full of sparkle and brilliance are set in a SOLID PLATINUM disk. They are set so expertly that even at a short distance they resemble a blazing solitaire worth $600. 2 emeralds or sapphires (specify) set in sides of the gorgeously engraved 14 Kt solid white gold mounting add to the beauty of this magnificent ladies' ring.

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SEND NO MONEY When you get the ring, pay only $2.00 to the postman. If you keep it, pay only $1.25 a week for one whole year. All credit dealings kept strictly confidential—No credit orders accepted from persons under 20 years of age.

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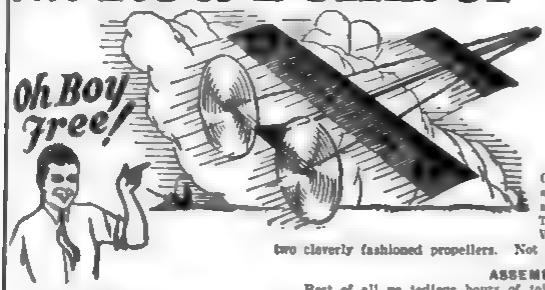
The Red Bomber Combat Plane Free



Positively a sensational offer. Here's the Red Bomber Combat Model Plane, a twin propeller model that flies amazingly. And you can have it free! Boys everywhere are flying model planes. Now is the time to get yours. This sensational plane will fly 600 feet easily, often further. Wings made of special fibre, two powerful rubber motors, two cleverly fashioned propellers. Not a glider—a real model plane.

ASSEMBLED IN TWO MINUTES

Best of all no tedious hours of toil constructing. This plane can be put together ready to fly by any boy in less than two minutes—positively! Two minutes after the postman delivers your plane, you can send it into the air diving and dipping, zooming, banking, then soaring to greater heights. Every boy will envy you. Own your plane right now!

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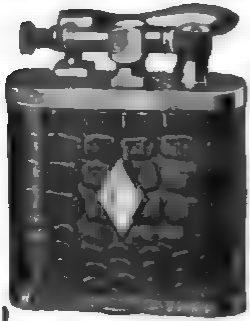

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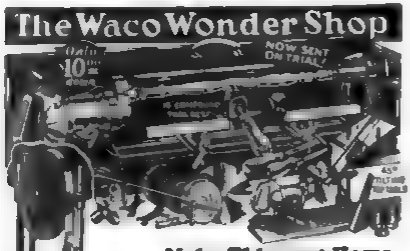

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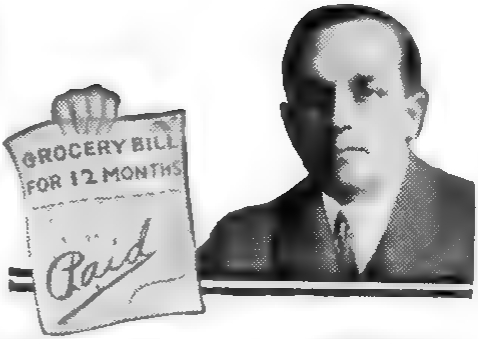

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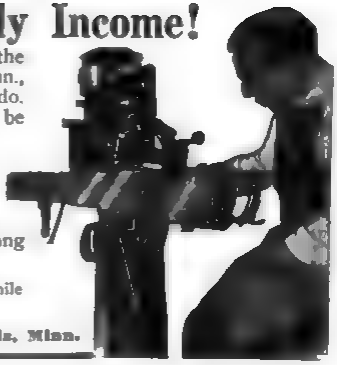

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Do you want a better position and a higher salary? You can have these if you can do the work. LaSalle experts will show you how, guide you step by step in your spare hours, help solve your personal business problems through the time-saving LaSalle Problem Method. Our *salary-increasing plan* enables you to prepare during your spare hours, without interference with your present duties. Simply mark on the coupon the field in which you desire success, and we will mail you a valuable book describing the opportunities in that field, together with an outline of our *salary-increasing plan*. Also copy of "Ten Years' Promotion in One." There is no cost or obligation. Find out how the *salary-increasing plan* starts average men and women on the high road to success and financial independence. Check and mail the coupon NOW.

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LA SALLE EXTENSION UNIVERSITY

The World's Largest Business Training Institution

Dept. 5493-R Chicago

Tell me about your *salary-increasing plan* for my advancement in the business field checked. Send also copy of "Ten Years' Promotion in One," all without obligation.

- ☐ Business Management
- ☐ Modern Salesmanship
- ☐ Higher Accountancy
- ☐ Traffic Management
- ☐ Railway Station Management
- ☐ Law—Degree of LL.B.
- ☐ Commercial Law
- ☐ Industrial Management
- ☐ Banking and Finance
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- ☐ Personnel Management
- ☐ Expert Bookkeeping
- ☐ Business English
- ☐ Commercial Spanish
- ☐ Effective Speaking
- ☐ C. P. A. Coaching
- ☐ Stenotypy
- ☐ Telegraphy
- ☐ Credit and Collection Correspondence

Name .....

Present Position .....

Address .....

SPEEDO- -PLANE FLYER

Rises from the ground, soars to great heights; comes down in a graceful glide to a perfect landing. Wing spread 16 in. Motor stick 14 in. 7-in. carved wood propeller. Match its performance against your $5 plane. Fully assembled; only 50 cents postpaid in U. S.

SPEEDSTER AIRPLANE

Fast flyer. Rises from ground under its own power. Speeds beautifully through the air. 11-in. wing spread. 9 1-2 long. 4 1-2 in. carved wood propeller. Only 25 cents postpaid in U. S.

Both Models Guaranteed to Fly or Money Refunded

Special for this month—Snappy, live rubber, 1-8 in. flat, 1-2 cent per foot; 3-16 in., 1 cent per foot. Postage 5c extra.

SPEEDO MFG. CO., Dept. D, 253 Albany Ave., Brooklyn, N. Y.

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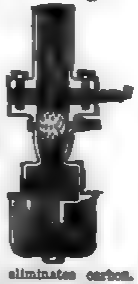
450 Miles on a Gallon of Gas!

According to a recent article by the president of the world's largest motor research corporation, there is enough energy in a gallon of gasoline if converted 100% in mechanical energy to run a four cylinder car 450 miles.



NEW GAS SAVING INVENTION ASTONISHES CAR OWNERS

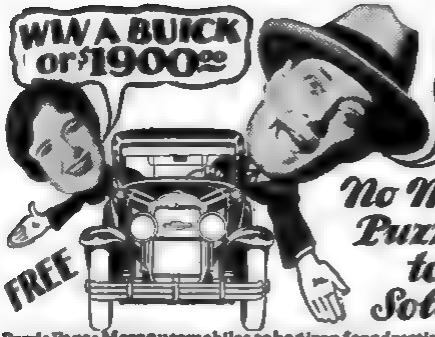
A marvelous device, already installed on thousands of cars, has accomplished wonders in utilizing a portion of this waste energy and in producing mileage tests that seem unbelievable. Not only does it save gasoline, but it also creates more power, gives instant starting, quick pick-up, and eliminates carbon.

FREE SAMPLE and $100 a Week

To obtain national distribution quickly, men are being appointed everywhere to help supply the tremendous demand. Free samples furnished to workers. Write today to H. Oliver, Pres., for this free sample and big money making offer.

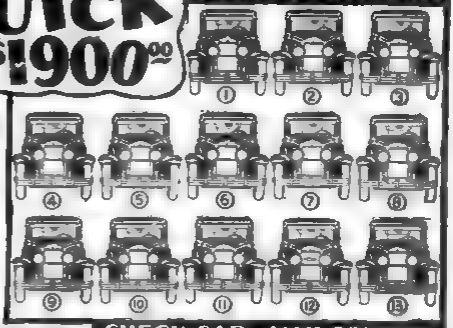
WHIRLWIND MFG. CO.

830 Third St. Milwaukee, Wisc.



WIN A BUICK or $1900.00

FIND THE DIFFERENT CAR



No More Puzzles to Solve

Puzzle Fans: More automobiles to be given for advertising purposes—J. C. Long, Charles Vogtmann, Viola Javins, Alvin Smith, Mrs. Gillies, J. Braucher, won sedans in last offers. Over 800 prizes awarded in one year. $11,000 in prizes paid by us in October, 1928. Here's your chance to win one of the prizes now offered.

Find the "Different" Auto The cars in the enclosure to the right all look alike. But one is different. Something has been left off all the cars but one. The difference may be in the fenders, bumper, nameplate, radiator or top. The one that is different is the real Buick sedan I am giving away in addition to three other cars in this great friendship advertising campaign. You may be the one who will write me

And Win Buick Sedan or $1900 Four sedans and 28 other prizes totaling over $5,000. Thirty-two prizes and duplicate prizes paid in case of ties. Certificate for $500 to apply on grand prize sent immediately as below if you find the different car. Immediate action—no delay—we send certificate for $500 to add to the first prize at once, if you win, and directions for getting Buick sedan. There are no more puzzles. Simply this one. No lists of words to make or write. Everyone actively interested can share in prizes or cash awards. Nothing to buy now or ever. Send coupon—no money. Simply fill out coupon, writing number of car you think is the different one and send it to M. W. Meyers, Dept. 174, 500 N. [redacted] St., Chicago, Illinois

CHECK CAR....MAIL COUPON

M. W. MEYERS
Dept. 174, 500 N. Dearborn St.
Chicago, Ill.

I think the different car is No. ....., Send me award certificate immediately if this is right. No cost or obligation to me now or ever.

Name_____

Address_____

City_____ State_____

Beautifully Illustrated AVIATION and MARINE Supply
Catalog - Postpaid
25c

Features Aviation and Aviators' Supplies & Equipment, Marine Supplies, MODEL AIRPLANE SUPPLIES & MODEL AIRPLANES and PARTS, Seaplane Type Speedboats, Seaplane Floats, Ice Boats & Snowsleds, Outboard Motor Boats, SKI-BOARD, the self-propelled aquaplane, German Air Gliders. Shop Tools & Equipment.

Will save you hundreds of dollars. Gives you information unavailable elsewhere on how and where to obtain supplies and materials for constructing your own speed crafts. Send quarter for your copy of this Catalog AT ONCE.

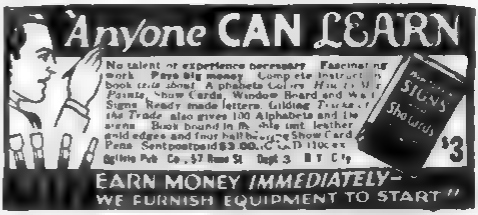
INTERNATIONAL ENGINEERING CORP., 708-E Westory Building **WASHINGTON, D. C.**

FOREST RANGERS

Men, get Forest Ranger job; $125-$200 month and home furnished; hunt, fish, trap, etc. For further details, write

NORTON INST. 1584 Temple Court DENVER, COLORADO

Anyone CAN LEARN



No talent or experience necessary. Fascinating work. Pays big money. Complete instruction book tells about Alphabets, Colors, How to Mix Paints, Show Cards, Window Board and Wall Signs, Ready made letters, Gilding, Tricks of the Trade, also gives 100 Alphabets and 100 signs. Book bound in flexible imit. leather, gold edges and four half-tone Show Card Pens. Sent postpaid $3.00. C.O.D. 10c extra. Gillies Pub. Co., 57 Rose St. Dept. 3 N Y City

EARN MONEY IMMEDIATELY—WE FURNISH EQUIPMENT TO START

WORK ABROAD?

WANT TO TRAVEL? Romantic . . . wealthy Southern countries need you. Want to go? Exceptional opportunities for young folks in Central and S. America, West Indies, Australia, etc. American employers pay fare and expenses. Get list, and "How to apply for position." Write today.

TROPICAL SERVICE BUREAU
[redacted] Alma Avenue Detroit, Mich.

BUCHSTEIN'S FIBRE LIMB

is soothing to your stump—strong, cool, neat, light. Guaranteed 5 years. Easy payments. Send for Catalog today.

Also fibre arms, and braces for all deformities.

I. Buchstein Co.
610 3d Ave. So.
Minneapolis, Minnesota

Build YOUR OWN Model Gas Engine with WALL CASTINGS and Detailed Drawings

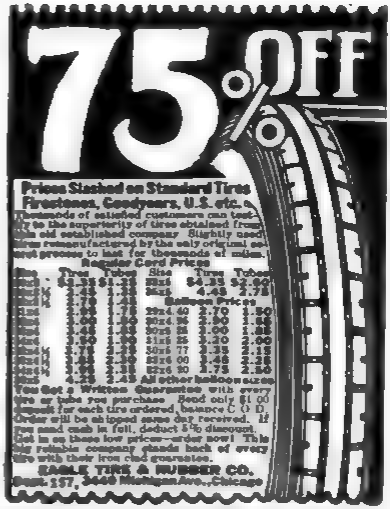
Scientifically designed for simplicity in construction and easy to build.
For MODEL AIRPLANES
POWER BOATS
STATIONARY PURPOSES
SHOP PRACTICE

Complete set of castings for the WALL Carburetor described in February Modern Mechanics is included in each set of engine castings.

The WALL AERO ENGINE for Model Airplanes is fully described, with other engines, in our circular on Wall Castings for Model Engines. Send 2c stamp for your copy.

Castings and Drawings for this Aluminum Engine
$14.00
Described in January Modern Mechanics

ELMER WALL
5000 N. Fairfield Ave.
Chicago, Illinois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Prices Slashed on Standard Tires
Firestones, Goodyears, U.S. etc.
Thousands of satisfied customers can testify to the superiority of tires obtained from this old established company. Slightly used tires remanufactured by the only original secret process to last for thousands of miles.
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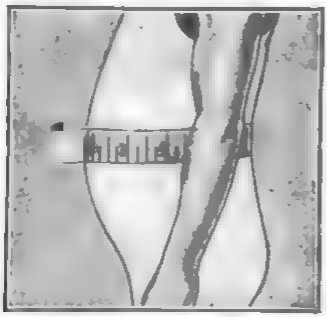
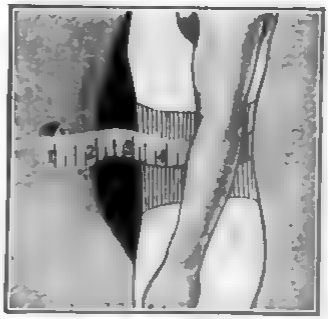
You Get a Written Guarantee with every tire or tube you purchase. Send only $1.00 deposit for each tire ordered, balance C.O.D. Order will be shipped same day received. If you send cash in full, deduct 5% discount. Get in on these low prices—order now! This big reliable company stands back of every tire with their iron clad guarantee.
EAGLE TIRE & RUBBER CO.
Dept. 157, 3440 Michigan Ave., Chicago





Free Proof That
WAISTLINE FAT
Can Be Quickly Reduced
—without drugs, diets or exercises

INSTEAD of wasting your time—instead of risking your health by weakening diets, exhausting exercises and pill-taking, in an effort to get rid of bulging waistline fat—try the popular Weil Reducing Belt for 10 days—at our expense.

Made of scientifically treated rubber it causes a gentle, unnoticed massage action as it comes in contact with flabby flesh. So that with every move you make, unwanted fat is being moulded away—*and kept away for good*—and at a fraction of the price charged by expert masseurs.

Look Thinner Instantly!

Take your waist measurement before and after this Free 10-Day Trial. Note the difference in inches. Feel the improvement in your general condition. According to the terms of our absolute guarantee, you must be thoroughly satisfied with the results secured—or you pay nothing.

Coupon Brings Free Details

Write us at once and you will receive our Special 10-Day Trial Offer—a detailed description of this most successful reducing method, the principles of which are highly endorsed by leading physicians and professional athletes everywhere. For the sake of your health and appearance take advantage of this offer at once. Send no money. Write now. The Weil Company, 1575 Hill Street, New Haven, Conn.

THE WEIL COMPANY,
1575 Hill Street, New Haven, Conn.

Gentlemen: Please send me complete description of the Weil Scientific Reducing Belt and also your Special 10 Day Trial offer.

Name.....

Address.....

City.....State.....

"We can't get Married Until-"

"WE CAN'T get married until I can earn more money." Thousands of young men are saying that today. Thousands of girls are giving that as the reason the marriage date is being put off and off. Sometimes it gets a little embarrassing, too, to have to keep on giving that excuse. *For no girl likes to admit that the man she is going to marry is a failure!*

It takes money to support a home these days. And you're right in waiting. But don't wait too long. The years of youth are precious years. Once gone, they will never return.

Thousands of men have happy, prosperous homes because they had the foresight to prepare themselves for advancement through the home-study courses of the International Correspondence Schools. Hundreds of them report salary increases of $10, $15, and $25 a week. Many are earning $75, $100 and $150 a week. Some have doubled and even tripled their salaries. Some are earning $10,000 and $15,000 a year. Others have become owners of businesses of their own.

If the I. C. S. can help other men to raise their salaries, it can help you. At least find out how. It won't obligate you to ask for our Free Booklets, but that one simple act may change your entire life. Do it now. Do it for HER!

Mail the Coupon for Free Booklet

INTERNATIONAL CORRESPONDENCE SCHOOLS
"The Universal University"
Box 2322, Scranton, Penna.

Without cost or obligation, please send me a copy of your booklet, **"Who Wins and Why,"** and full particulars about the course *before* which I have marked X in the list below:

BUSINESS TRAINING COURSES

- ☐ Business Management
- ☐ Industrial Management
- ☐ Personnel Management
- ☐ Traffic Management
- ☐ Accounting and C. P. A. Coaching
- ☐ Cost Accounting
- ☐ Bookkeeping
- ☐ Secretarial Work
- ☐ Spanish ☐ French
- ☐ Salesmanship
- ☐ Advertising
- ☐ Business Correspondence
- ☐ Show Card and Sign Lettering
- ☐ Stenography and Typing
- ☐ English
- ☐ Civil Service
- ☐ Railway Mail Clerk
- ☐ Mail Carrier
- ☐ Common School Subjects
- ☐ High School Subjects
- ☐ Cartooning
- ☐ Illustrating
- ☐ Lumber Dealer

TECHNICAL AND INDUSTRIAL COURSES

- ☐ Architect
- ☐ Architectural Draftsman
- ☐ Building Foreman
- ☐ Concrete Builder
- ☐ Contractor and Builder
- ☐ Structural Draftsman
- ☐ Structural Engineer
- ☐ Electrical Engineer
- ☐ Electrical Contractor
- ☐ Electric Wiring
- ☐ Electric Lighting
- ☐ Electric Car Running
- ☐ Telegraph Engineer
- ☐ Telephone Work
- ☐ Mechanical Engineer
- ☐ Mechanical Draftsman
- ☐ Machine Shop Practice
- ☐ Toolmaker
- ☐ Patternmaker
- ☐ Civil Engineer
- ☐ Surveying and Mapping
- ☐ Bridge Engineer
- ☐ Gas Engine Operating
- ☐ Automobile Work
- ☐ Airplane Engines
- ☐ Plumber and Steam Fitter
- ☐ Plumbing Inspector
- ☐ Foreman Plumber
- ☐ Heating and Ventilation
- ☐ Sheet-Metal Worker
- ☐ Steam Engineer
- ☐ Marine Engineer
- ☐ Refrigeration Engineer
- ☐ R. R. Positions
- ☐ Highway Engineer
- ☐ Chemistry
- ☐ Pharmacy
- ☐ Mining Engineer
- ☐ Navigation ☐ Assayer
- ☐ Iron and Steel Worker
- ☐ Textile Overseer or Supt.
- ☐ Cotton Manufacturing
- ☐ Woolen Manufacturing
- ☐ Agriculture ☐ Fruit Growing
- ☐ Poultry Farming
- ☐ Mathematics ☐ Radio

Name.....

Address.....

City.....State.....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

Muscles 5c apiece!

WOULDN'T it be great if we could buy muscles by the bag—take them home and paste them on our shoulders? Then our rich friends with money to buy them, sure would be socking us all over the lots. But they don't come that easy, fellows. If you want muscle you have to work for it. That's the reason why the lazy fellow never can hope to be strong. So if you're lazy and don't want to work—you had better quit right here. This talk was never meant for you.

I Want Live Ones

I've been making big men out of little ones for over fifteen years. I've made pretty near as many strong men as Heinz has made pickles. My system never fails. That's why I guarantee my works to do the trick. That's why they gave me the name of "The Muscle Builder."

I have the surest bet that you ever heard of. Eugen Sandow himself said that my system is the shortest and surest that America ever had to offer.

Follow me closely now and I'll tell you a few things I'm going to do for you.

EARLE LIEDERMAN, The Muscle Builder
uthor of "Muscle Building," "Science of Wrestling and Jiu Jitsu," "Secrets of Strength," "Here's Health," "Endurance," Etc.

Here's What I Guarantee

In just 30 days I'm going to increase your arm one full inch. Yes, and add two inches to your chest in the same length of time. But that's nothing. I've only started; get this—I'm going to put knobs of muscles on your shoulders like baseballs. I'm going to deepen your chest so that you will double your lung capacity. Each breath you take will flood every crevice of your pulmonary cavity with oxygen. This will load your blood with red corpuscles, shooting life and vitality throughout your entire system. I'm going to give you arms and legs like pillars. I'm going to work on every inner muscle as well, toning up your liver, your heart, etc. You'll have a snap to your step and a flash to your eye. You'll feel the real pep shooting up and down your old backbone. You'll stretch out your big brawny arms and crave for a chance to crush everything before you. You'll just bubble over with vim and animation.

Sounds pretty good, what? You can bet your old ukulele it's good. It's wonderful. And don't forget, fellow—I'm not just promising all this—I guarantee it. Well, let's get busy, I want some action—So do you.

SEND FOR MY NEW 64-PAGE BOOK "Muscular Development" **IT IS FREE**

EARLE LIEDERMAN,
Dept. 5505, 305 Broadway, New York City

Dear Sir:—Please send me without any obligation on my part whatever, a copy of your latest book, "Muscular Development." (Please write or print plainly.)

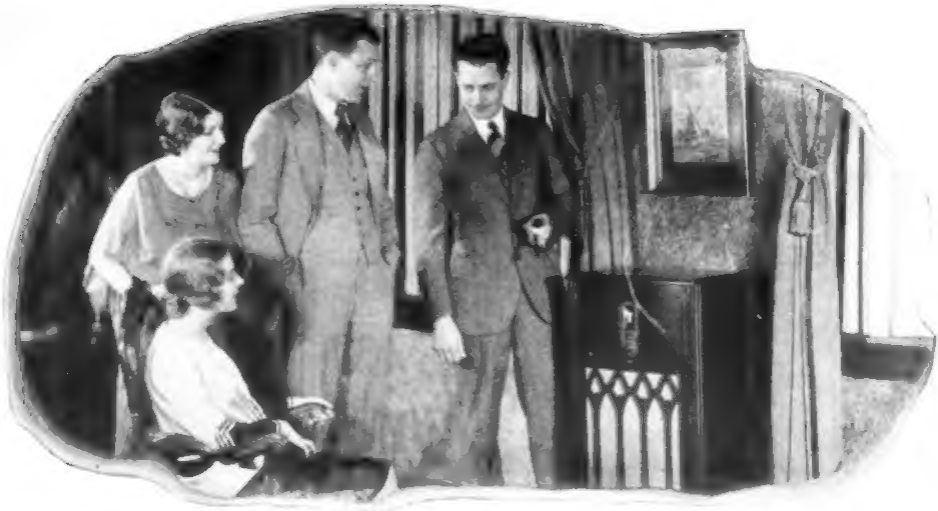
Name..... Age.....

Street.....

City..... State.....

It contains forty-eight, full page photographs of myself and some of the many prize-winning pupils I have trained. Some of these came to me as pitiful weaklings, imploring me to help them. Look them over now, and you will marvel at their present physiques. This book will prove an impetus and a real inspiration to you. It will thrill you through and through. This will not obligate you at all, but for the sake of your future health and happiness, do not put it off. Send today—right now, before you turn this page.

EARLE LIEDERMAN
DEPT. 5505 **305 BROADWAY, N. Y. CITY**



They Could Hardly Believe Their Own Ears—

when I Switched to Ground Wave Reception!

"IT'S no use trying to listen in tonight," said Bill as I took his hat. "Jane and I tried to get reception during dinner but all we got was static. It's usually this way—just the night they broadcast Paul Whiteman's band or some other good program it's spoiled by howls and fading."

"Perhaps my set will do a little better," I suggested. I had a surprise in store for him!

He looked doubtful as I turned on the set switch. I had left my old aerial antenna attached on purpose and soon the room was filled with an ear-splitting excuse for music. Manipulation of the dials only served to make it worse. Occasionally it faded out altogether. Then the howls would start up again until my wife finally shouted, "Turn that thing off—it's terrible."

Satisfied, I laughed and disconnecting the old aerial and ground wires I then attached the lead-in wires of my new underground antenna, which I had installed just before dinner. "Now listen!" I commanded.

The Thrilling Test

As though by magic, the sweet high notes of violins and the stirring sobbing of saxophones brought Bill to his feet! Jane looked dumbfounded. The static was so greatly reduced that we hardly noticed it! We were getting one of the year's best programs with scarcely any trouble on a wild, stormy night.

"You see," I explained later to Bill, "I buried my new underground aerial about two feet below the ground, where wind and storms can't affect it so easily. They call this thing "Subwave-Aerial" and it's insulated some way to keep out interference and noise. It's combined with a scientific ground so I'm sure now that I have the correct ground connection. All this isn't costing me any more than my old aerial antenna. And I'll never need to touch it again. It's guaranteed for 25 years.

Hardly necessary to say that Bill went home with the name and address of the Subwave-Aerial manufacturers in his pocket.

Test It Yourself—FREE!

The above story illustrates the results for which the designers of Subwave-Aerial struggled for months. At last, enthusiastic reports such as this from Radio Experts reproduced here, proved that they had succeeded. Now you have a chance to prove the merits of this great new radio development for yourself. Try if possible, to pick a night when static is bad and make the thrilling test. It's fun! And if you are not more than pleased, the test won't cost you a cent. Be sure to send at once for all the interesting details on the development of Subwave-Aerial. Use the coupon NOW!

SUBWAVE-AERIAL Gets DX Installed 50 Feet From 60,000-Volt Power Line

"On January 27, 1929, drove out near the Sanitary District power plant—stopped about 50 feet distant from 60,000-volt transmission line—dug a small hole, into which we dropped the Subwave-Aerial, attaching the lead-in wires first to a 5-tube Freshman, then to a single-dial Atwater Kent, Model 35.

"We got WCCO, St. Paul, Minn., and Toronto, Can., loud and clear—not the slightest interference from the 60,000-volt power line 50 feet away. It was impossible to get reception with an overhead aerial under the same conditions." Yours truly,

F. Bennett Smith,
Harry R. Jackson.

UNDERGROUND AERIAL PRODUCTS
Suite 618, St. Clair Bldg.
Dept. 724-G-E.
St. Clair and Erie Streets
CHICAGO, ILLINOIS

UNDERGROUND AERIAL PRODUCTS.
Suite 618, St. Clair Bldg., Dept. 724-G-E.
St. Clair & Erie Sts.,
Chicago, Ill.

Rush Illustrated literature on the new Subwave-Aerial and details of your Free Test Offer.

Name .....

Address .....

City ..... State .....

173 PIECES ONLY $29.95

110 Piece Dinner Set

FREE 13 Piece Glass Water Set

Rose Tinted

The entire 13 pieces are decorated with a design like the 110-piece dinner set, producing a uniformity of beauty and coloring. Both the jug and glasses are in the very latest rose glow tint, and the decorations are put on practically as they are applied to the dishes, rich and colorful. Set includes a quaint shaped jug of 1 1-2 quart capacity, with 12 8-oz. tumblers for water, grape juice, ginger ale or any other beverages.

A Complete Service for 12 People

Free Bargain Catalog Sent with or without order. See the coupon

50 Piece Silver Set

$1.00 Down *brings it on* Free Trial

An astounding price-smashing bargain on 173 pieces of china, silver and glassware. *Just $1.00* with coupon below brings the outfit to your home on 30 days free trial. The 13 piece glassware set is included *free*, if you send at once.

Examine the value, the quality, the beauty of each piece. Then compare prices—yes, even spot cash prices. See how much you *save* on this amazing offer. After 30 days trial and use, if you're not delighted send it back at our expense and we'll refund your dollar plus all transportation charges you paid.

173 Pcs. consisting of
110-piece Decorated Ivoryware Dinnerware Set

Rich ivory color, each piece of a distinctive shape and design, decorated with a cluster of flowers, including asters, bluebells, violets and tulips all in their natural colors, forming a magnificent contrast on the field of creamy semi-porcelain ware. Each piece is triple baked by the tunnel kiln baking process, producing a perfect glaze semi-porcelain finish. Consists of 12 dinner plates, 9-inch; 12 breakfast plates, 7-inch; 12 coupe soups, 7 1-2-inch; 12 fruit saucers, 5 1-4-inch; 12 oatmeal dishes, 6 1-4 inch; 12 cups; 12 saucers; 12 bread and butter plates, 6-inch; one oval vegetable dish, 9-inch; one round vegetable dish, 9-inch; one sugar bowl and cover (two pieces); one platter, 10 1-4-inch; one platter, 13-inch; one covered vegetable dish (two pieces); one gravy boat; one gravy boat stand; one bowl, 1 pint; one cream pitcher; one pickle dish; one butter dish, 8 5-4-inch.

50-Piece Silver Set

Each piece is heavily silver plated on nickel silver base. 12 knives, 12 forks, 12 dessert spoons, 12 teaspoons, 1 sugar shell and 1 butter knife.

13-piece Glassware Set FREE, if you send at once. See description above.

Shpg. wt. of complete 173 pcs. about 150 lbs.

Order by No. G2918A. $1.00 with coupon, $2.70 a month. Total bargain price, $29.95.

$2.70 a Month

But if you decide to keep the outfit start paying only $2.70 a month until you've paid our special sale price—*only $29.95*—for the entire outfit with the 13-piece glassware set FREE. Almost a year to pay. Where else can you find such a bargain and on such easy terms?

Send Coupon Now

Hurry—don't delay! Remember the 13-piece glassware set is free if you order at once. 30 days free trial. Send coupon now while this special offer lasts.

Straus & Schram
Dept. 4735 Chicago, Ill.

Straus & Schram, Dept. 4735 Chicago, Ill.

Enclosed find $1. Ship the special advertised 173-piece outfit (13-piece Glassware Set FREE). I am to have 30 days free trial. If I keep the outfit, I will pay you $2.70 monthly. If not satisfied, I am to return the Outfit and you are to refund my money and all freight or express charges I paid.

173-piece Outfit No. G2918A, $29.95

Name .....

Street, R.F.D. or Box No. .....

Shipping Point .....

Post Office ..... State .....

Married or Single ..... Nationality or Color .....